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THE PSYCHOLOGICAL REVIEW

REASONING IN RATS AND HUMAN BEINGS[1]

BY NORMAN R. F. MAIER
University of Michigan

INTRODUCTION

In the present paper I wish to present a rather general picture of the reasoning process as I understand it. Because of the magnitude of the complete picture, it will be necessary to eliminate the historical background and to abbreviate the experimental evidence. It is my main purpose to integrate the experimental work which has been done on rats and humans and attempt to formulate a theory of the reasoning process. So often it is implied that reasoning ability resides only in human beings. Since human beings make the claim, we may question its objectivity. I do not believe that psychological terms should be restricted to certain species. Rather a psychological term should designate a process and different processes should be designated by different terms.

THE COMBINATION OF ISOLATED EXPERIENCES

In order for the term reasoning to have any value, it should designate a process which is not only qualitatively different from learning, but a process of a higher order. Since learning is an adjustment dependent upon past experience, we might expect reasoning to designate a spontaneous adjustment—one which requires no previous repetition. Experimental evidence alone can give such a hunch a sound basis.

Experiments with rats have shown that they are capable of such spontaneous adjustments (Maier, 1929). If, for exam-

[1] Jacob H. Schiff Foundation Lecture delivered at Cornell University, December 17, 1936.

ple, a rat is permitted to thoroughly explore a room furnished with a table to which a ladder is attached, it will learn its way about the room and how to use the ladder to go to and from the table. The various things it experiences during this exploration period may be designated as Experience I.

We will now fence off a corner of the table and lead an elevated path from this corner to a second ladder. The rat can now be trained to run from the base of this new ladder to the fenced-off corner of the table for food. The experience of running over this route for food may be designated as Experience II.

With this background of experience, we may present the animal with a problem which requires the combination of parts of these separate experiences. Suppose the rat is placed on the table with food still behind the fence. Will it indefinitely attempt to reach the food directly or will this point on the table become associated with the food by way of the elevated path? If such an association is established, then Experiences I and II must become integrated without previous repetition. To obtain the food, the rat must descend to the floor and then go to the starting place of the elevated path which leads to food.

Many experimental tests have demonstrated that in situations of this sort the rat does successfully reach the food, and it does so directly and not by good fortune. I should, however, not wish to imply that such problems are solved without difficulty. A few animals fail, and those that succeed must be tested under favorable conditions, *i.e.*, conditions which do not encourage habitual behavior. We have considerable evidence which supports the view that rats are capable of combining parts of separate experiences other than through accident or past association.

However, it is possible that the experimenter, through faulty thinking, is blinding himself to a simple solution to the above problem and is attributing to the rat his own technique for solving this problem. To test this possibility it is necessary not only to exclude chance solutions, but to demonstrate that the process used by the rat in this problem is different

from the learning process. This was accomplished by setting a response based on learning in opposition to one based on combining separate past experiences (*i.e.*, reasoning). When this was done, the responses based upon reasoning decreased. In a similar manner, the problem was so arranged that responses based on reasoning and learning led to the same goal. When this was done, the successes increased. By variations of this sort, the relative value of reasoning and learning was measured. Of importance is the fact that cortical injuries reduced the role played by reasoning whereas the role played by learning ability remained constant (**11**). Thus the same injuries which affected one process left the other intact. This would indicate that our assumption of two qualitatively different processes was a valid one. Other evidence which supports this view is the fact that Campbell (1935) found no correlation between performance on reasoning and learning tests, but a positive correlation between different learning tests. Age also has a different effect on the scores made on learning and reasoning tests. Young rats are superior to adults in maze learning, whereas adults are superior to young rats in reasoning problems (**7, 16, 12**).

Nursery school children have been tested in the same problem situation as rats, and it was found that below five years of age they failed as badly as young rats and were surpassed by adult rats. The tests involved the combining of separate parts of enclosed pathways in such a manner as to achieve a goal (Maier, 1936). Adult human beings were tested on somewhat more complex problems, but the principle remained the same. In one experiment, the solution of a problem depended upon the correct combination of three elements of experience, *A*, *B*, and *C*. None of the subjects succeeded. Even when these elements were described and the subjects were informed that all they had to do was to integrate them, successful solutions were not forthcoming. This indicates that a knowledge of what past experience to use is quite inadequate to problem solving and gives us some appreciation of the achievements of rats. It was not until a point of view, something related to integration, was given to the subjects that solutions began to appear (**9**).

Thus we may say that reasoning is primarily characterized by a new combination of old experiences which is adequate to meet a situation. If a new combination does not appear, inadequate responses based on native and acquired mechanisms are applied. Rats with cortical injuries are stereotyped in their behavior and continually repeat errors. Gottschaldt (3) found that feeble-minded children failed to stack blocks successfully because they never varied their method of stacking them.

If the production of new combinations makes possible the solution of new problems, it then becomes our task to discover the factors which determine the nature of these new combinations. Past experience furnishes us the elements which must be combined, but what is the nature of this integration process?

The Process of Integration

The investigations on human subjects (9, 10) throw most light upon this problem, and we can best characterize it by presenting a concrete situation.

Suppose two strings are hanging from the ceiling and are of such length that they just reach the floor. A subject is then asked to tie the ends together. This is a simple task for any person until he discovers that when he has hold of one string he cannot reach the other. The subject is now confronted with a problem. But all subjects in this same situation will not be confronted with the same problem. Each one may experience a different difficulty and the solution depends on overcoming it. For one, the difficulty may be "my arm is too short." This is characterized by the fact that the behavior of the individual will be related to increasing his reach. He will employ poles, chairs, extension wires, etc., to hook in the string which is out of reach. His first solution will involve the pole.

Another subject's difficulty may be described as "the string in my hand is too short." This subject may use the above mentioned tools, but he will use them to increase the length of one string and will get hold of the distant string with

his hand. His first solution will undoubtedly involve the extension wire.

Still another person will carry the one string as near to the second as he can, let go of it, and run quickly to grasp the second string, only to find that the first has fallen back to its original position. His difficulty may be characterized as "that string won't stay where I put it." Behavior which illustrates this approach to the problem will be characterized by solutions which anchor the one string as near to the mid-point as possible. The chair best serves this purpose.

Thus we see that the early solutions to this problem may be classified into three distinct groups. Each individual tends to begin in one of these ways, and when pressed for more solutions introduces variations of the original one. Under pressure to produce different kinds of solutions, the same individual may produce all three types.

If now the above mentioned material is not present in the room and the subject has at his disposal only such objects as nuts, bolts, pliers, bottles, and the like, the above experienced difficulties cannot be overcome and the problem will be insoluble. These objects will not sufficiently increase the arm's reach, lengthen one of the strings, or serve to anchor a cord sufficiently near the mid-point. To solve the problem, a difficulty which can be overcome must be experienced. In the above solutions, the subject always got one string while holding (either directly or indirectly) the other. This is now impossible. A way out is to experience as a difficulty "the string doesn't come to me." Behavior patterns which characterize this difficulty are as follows: (*a*) the window is opened (in the hope that the wind will blow the free string within reach of the subject); (*b*) an electric fan is requested; (*c*) now and then attempts are made to create sufficient suction with the mouth; and finally (*d*) a weight is tied to one string, thus forming a pendulum. Any of the second list of objects will serve as a pendulum bob, and thus the string can be made to come to the subject.

From experiments of the above type we may conclude that some form of difficulty is experienced in the problem situation.

Its nature depends upon the subject's characteristic reaction and determines what objects and memories will become related to the situation. We might say that every individual when confronted with a problem sets out in a particular direction. This direction may be regarded as a general process which determines the way various objects will be experienced. As an electric field determines the property of objects in the field, as the physiological gradient determines growth processes in the field, so this process of direction may be regarded as a field process determining for the time the nature of present and remembered objects and events.

When the process is one which results in increasing the reach, poles, chairs, and extension wires all become poles; and pliers, nuts, and bolts give no reaction at all. When the string must be anchored, a different set of utilities are found for the same objects, and the chair becomes the most used object. The pliers may be reacted to, but are given up when they are insufficient to hold the string sufficiently near the center. In doing this, a pendulum which drags on the floor is actually constructed, yet I have never seen this activity suggest the pendulum solution. The pendulum must not drag, but when an anchor is required, the weighted string must reach the floor near the mid-point. When the subject's thinking takes this direction, the pendulum is functionally not a pendulum. Once a direction is assumed, it tends to persist, and this prevents new directions from being established.

An illustration will best show the influence of persistence in problem solving. A particular problem required that a candle in a fenced-off region be extinguished. The nearest approach to the candle was eight feet. To solve this problem, it was necessary to make a long hose out of short pieces of lead and rubber tubing. When this long tube was mounted on a long pole, the subject could control the tubing and thus blow out the candle.

With the solution in mind, we can now examine the behavior of an intelligent graduate student.

The habitual thing to do, of course, was to blow at the candle. This the subject in question did, and after some time

remarked that she could not blow hard enough. She then turned to tools. From the material on the table, she selected some short pieces of lead and rubber tubing. These she fastened together, alternating lead with rubber segments until she had one tube about thirty inches long. She then blew at the candle through this tube, but without success. The tube should have been made longer, but a longer tube of such a flexible nature could not be supported with the hand. However, the subject did not regard the lack of support as the difficulty. She still said that she could not blow hard enough, that she could not get enough air through the tube.

A suggestion was then given. A long tube was made by alternately joining together lead and rubber segments, and water was then siphoned through it. This might have suggested the use of a longer tube for blowing out the candle. But this is not what the subject saw in the suggestion. She filled her mouth with water and blew the water at the candle through her short series of tubes. The air she had previously blown had not been satisfactory, so substituting water for air was in line with her direction. When this failed, she continued with the idea and threw the water directly with a glass. This had to be discontinued to prevent a flood.

Then a second suggestion was given. While sitting on a chair she was asked to hook a piece of cord on a nail in the ceiling with the use of a long pole. The pole served to span the distance between her and the ceiling, and might have suggested a support for a long tube.

Again the suggestion failed. It gave her the idea of tying cord around the joints of the lead and rubber segments to prevent leakage of air. This again was in harmony with her difficulty of not getting enough air through the tube.

A third suggestion, which was meant to be of no use, was then given. It consisted of merely offering her a cigarette. As usual, the suggestion was used in a manner that was harmonious with her direction. She smoked the cigarette and blew smoke through the tubes at the candle.

This behavior is rather typical and shows how a direction determines the meaning of perfectly good suggestions.

One of the important factors which determines direction is past experience. The difficulties we see in new problems are usually old ones, and these difficulties give us habitual directions. When habitual directions are satisfactory, the problems are simple; when they are not, the problem is difficult. The above described problem which required tying the strings together can be achieved by any college student, but less than 35 per cent can solve it when the pendulum is the only solution. Making strings come to us is not part of our repertoire of habitual approaches to problems.

In constructing a hat rack out of two poles and a table clamp, subjects invariably build a structure with legs. Since the material allows for but two legs, failure to solve in two hours is the rule. One should clamp the poles together end to end and wedge between the floor and the ceiling and use the clamp for a hook. This use of the material is a new integration.

Thus generally speaking, the directions employed are habitual. Problems which do not fall within the habitual directions are the difficult ones.

Because of the influence of habitual directions and because a direction once established tends to persist, problems often go without solution. If subjects are instructed to refrain from habitual directions and if they are warned against persisting in a particular direction, the number of problems solved by a group increases from 20 per cent to 40 per cent (13). This shows that no direction at all is better than a false one.

In animals, the presence of direction is illustrated by Krechevsky's work (5, 6). The responses of rats in a problem situation are in accordance with what he calls hypothesis. They behave as if they were trying out some principle. Cortical injury reduces the number of such hypotheses. My own rats solve problems involving a round-about route to food readily after they have solved a few problems which require an indirect route, even though the nature of the route may be new. Köhler (4) described his surprise when apes used poles to climb up to the banana rather than to knock down the banana. To the ape, the pole was a different thing than it was to Köhler.

What determines the correct direction is difficult to say. Good reasoners vary their directions readily, and poor reasoners persist. Animals with brain injuries also show such persistence. Whether or not variability will suffice to find the correct direction, cannot be said. That persistence is a handicap cannot, however, be doubted.

The Nature of the Experience of Insight

Insight is often used as if it explained problem solving. At best it can be regarded as an experience which accompanies problem solving in humans. As an experience it is worthy of consideration even if it plays no causal role in the process.

My investigations have convinced me that a description of one's own experience does not include the important events which precede a solution. As a matter of fact, a state of chaos usually precedes the solution. After the solution is found, it calls up certain associations and these are reported as antecedent events. For example, subjects who find the pendulum solution report that they found the solution because they learned about pendulums in physics, because they had a swing when young, or because they had images of monkeys swinging in trees. Many subjects can only report, "It just occurred to me."

But what have these descriptions to do with making a string come to you or with tying two strings together? Pendulums are associated with pendulums, but before the solution is found, there is no pendulum. As a matter of fact, one can cause solutions to occur by the use of suggestions, yet individuals so helped give reports which differ in no way from those given by subjects who found the solution without help.

In one experiment, subjects who failed to find the pendulum solution were exposed to the following suggestion: The experimenter in walking about the room bumped into the free string and set it in slight motion. As a consequence about half of them solved the problem immediately. Their report of how they found the solution was like that of individuals who solved without suggestion. Either these subjects failed to experience the suggestion or they did not wish to report it.

To determine this, a useless suggestion was given. When no solutions appeared, the good suggestion was given and a large number of solutions followed. When the subjects were asked where they got the idea, they, without hesitation, gave credit to the first suggestion which had been demonstrated to be useless. It seems that lack of experience of the important antecedent event is responsible for its not being reported. This is not altogether surprising. Since it sets off the solution, it is engulfed by it and thus loses its identity. The subject can only report a previous incident. It is perhaps because of such reports that the 'trial and error' theory has gained popularity. We can report distinct preceding events but mistake them for causal events.

If the solution is a reorganization of past experiences, then the pre-solution period is characterized by disorganization. Like the hen in the puzzle picture, it appears when different parts of a background suddenly become an object, and we experience no intermediate step. It is an all-or-nothing process.

With the appearance of the solution, there is a change in meaning which is as sudden as the reorganization (Wertheimer, 1925). Objects and memories now have new relationships and these determine their meanings. The combination of words in "It is better to have loved and lost" has a meaning derived from past experience; but if we say, "It is better to have loved and lost—much better," we experience irrelevance at first and then a sudden change in the meaning of the old parts when a new unified organization is experienced. Another illustration makes this even clearer. The elements in a list of words have meaning derived from numerous past experiences or previous organizations. When they are placed together, they achieve a specific meaning. Thus, bottle, glass, alcohol, table, noise, men in white coats, and cat, fit together to form a restaurant scene. When we add, ringstand, test tube, bunsen burner, to the list, there is conflict—then reorganization. It all becomes a laboratory and the old meaning of each element changes to a new specific meaning. The alley cat becomes pickled in the alcohol we were drinking.

So the pliers in our pendulum problem change from a tool to a weight and become equal to bolts, nuts, and hammers. These old familiar objects in new organizations become new things. This is a jolt, and gives us the experience we call insight.

Application of the Present Theory of Reasoning to Certain General Problems

Sometimes a theory becomes more meaningful and specific when it is applied to other situations. The pragmatic test is often more convincing than logic and at the same time aids in distinguishing between concepts which may appear identical. According to the present theory, reasoning is creative rather than reproductive or accidental. The Würzburg school (**1**, **15**) made reasoning a matter of selective reproduction and used the determining tendency to designate the selective process. The trial and error theory (**2**) made reasoning a matter of persistence, good fortune, and past experience.

1. By regarding reasoning as a new combination of past experiences, we designate a mechanism which differs from learning and yet utilizes what has been learned. From this it follows that new ideas are possible. Because learning and reasoning are different mechanisms or processes, some individuals may have originality and be poor learners, whereas others may be good learners and poor reasoners. This psychologists in general recognize, yet they deny the possibility in the theories of reasoning which they generally accept.

2. Because new combinations of past experience change the meanings of all parts, we can account for the surprise and thrill which accompanies the solution.

3. We can also see how people having different directions in thinking may use the same facts in diametrically opposed fashions. Thus the radical and conservative individuals differ most in what certain objective measurements mean rather than in the measurement.

4. In education, students often fail to grasp a problem even when teachers show them how to solve the problem. Unless the direction of the student corresponds to that of the

teacher, any hints or suggestions the teacher may give are practically useless. Until the directions correspond, the student can't 'see the point.' Let me illustrate with a story. A man is travelling in the vicinity of the Isle of Man and is on the lookout for a Manx cat. In a station he sees a bob-tailed cat lying near the stove. Excitedly he says to the station agent, "Ah—a Manx cat—eh?" And the station agent replies, "No—the 5:42 going west." The man thanks him and goes about his business. His question has been answered, and if you don't believe it, it is because you haven't the correct direction. You know the answer but it isn't related to the issue until you get the pertinent organization.

5. It is generally recognized that young men have made more than their share of the great discoveries. Because of habitual directions in thinking, we can see why young men are likely to be more creative than old. Young men do not know of so many ways of attacking a problem and so may use a new approach while the trained man is trying out old ones. After old methods are used for a while certain problems persist in causing trouble and the man with a new approach has the better chance to solve it. From the above it also follows that young men will be more radical than old.

6. For the same reason that young men have a better chance than old men at being creative, new theories enjoy a period of great fertility. The new theory suggests a different methodology, and so a group of problems may be solved which the older theory found insoluble. The student of a great man may have only habitual directions, but because his habitual direction is relatively new he may enjoy great prominence.

7. Likewise we can see why men trained in one science often make great contributions in another.

8. Because of the persistence of directions in thinking, we can understand why great discoveries are often made when there is no attempt to make them. The bath tub, the golf course, the theater, and a good night's sleep are often conducive to creative work because they are not related to the task at hand and so remove the persistent direction. It is

rather characteristic of great discoveries to appear when they are not being sought.

Thus we find that learning, although it furnishes us data with which to solve problems, also furnishes us with habitual directions and so interferes with new adaptations. If education is purely the acquisition of knowledge, it may well polish the pebbles and dim the diamonds. A store of knowledge is essential to solve problems, but too much knowledge may result in the tendency to seek solutions in this background. Since progress requires new solutions which depend on new directions, such a tendency will retard progress. To meet new situations, knowledge must be manipulated, and training along this line may counteract the influence of habitual directions.

In research the emphasis on practice is likely to set up habitual directions. What work will be practical is determined by old ways of thinking. These will give rise to habitual approaches. To form a theory, many facts must be integrated and emphasis on theory will therefore lead to new techniques. This emphasis will therefore be more productive and incidentally will have wide implications in practice. Applications which otherwise would never have been dreamed of are the product of theoretical thinking.

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THE RELATIONSHIP BETWEEN SUCCESS AND THE LAWS OF CONDITIONING

BY HAROLD SCHLOSBERG

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The purpose of the present paper is to differentiate between two types of learning, namely, that involving simple conditioning, and that involving the law of effect. First, I shall describe the particular results which brought the question to my attention, and show that these results are related to two different sets of 'laws' of learning. I shall then survey a number of classical conditioning experiments in an attempt to see how well the differentiation has been made in the past. Next I shall develop the thesis that there are two somewhat different types of learning:

(1) Simple conditioning, which applies particularly to diffuse, preparatory responses.

(2) 'Effect' learning, which applies particularly to precise, adaptive responses, and makes greater demands upon the nervous system than does simple conditioning.

Finally, I shall discuss the original experiments in light of this tentative distinction, and point out the implications.

In a series of three papers (**35**, **37**, **38**), and several abstracts (**32**, **33**, **34**, **36**), a number of experiments on conditioned responses in the white rat have been described. The animal was always restrained in a holder, while auditory or visual stimuli were presented in conjunction with a shock to the tail or to the foreleg. One of the most notable results to emerge from these experiments was the greater effectiveness of an unavoidable shock, as compared to one that could be avoided or terminated by the appropriate response. These results are consistent with traditional laws of conditioning, and may be attributed to differences in the duration and frequency of shocks involved in the two methods. In the first place, the duration of the unavoidable shock was set by a timer at

either .16 sec. or .33 sec. The duration of the avoidable shock was determined by the latency of the withdrawal movement, and usually fell below .1 sec. With such short intervals the difference in duration was roughly equivalent to a variation in the strength of the shock, so that the unavoidable (fixed) shock would be expected to be more effective as an unconditioned stimulus. The results indicated that this was true, since breathing, tail and leg responses were conditioned more readily with the fixed than with the avoidable shock. In the second place, if the conditioned stimulus preceded the shock by a moderate interval (.33 sec.) a prompt conditioned leg movement would actually prevent the shock. Thus, 'reinforcement' ceased as soon as a conditioned flexion reflex started to develop and 'extinction' might have been expected. This is exactly what did happen (37). One rat that had already developed a stable conditioned flexion with a shock of fixed duration was changed to the avoidable shock situation. The first few responses avoided the shock, and the response waned as extinction set in. This led to additional reinforcement, which built up the response, until the rat was again avoiding the shock. This sequence was repeated over and over again, through six sessions of 16 buzz-shock stimulations each. Thus, it seems clear that the response established in these experiments closely followed the usual laws of conditioning.

These results are in marked contrast with those reported by Hunter (16), and by Culler.[1] Hunter studied the white rat in a circular alley. A light or buzzer preceded the charging of the floor of the alley by 2 sec. Much more rapid 'conditioning' occurred if the shock was omitted every time the animal ran in response to the buzzer or light than was obtained when the animal was shocked every time, regardless of its response. Culler reported that Brogden found comparable results with the use of a rotating device, similar to an activity cage. Why are these results in complete contrast to mine?

It is immediately apparent that the difference between the two sets of results is not peculiar to the experiments

[1] Culler reported the work of Brogden in his symposium paper at the 1936 meetings of the American Psychological Association.

described above. Indeed, the contradiction seems to be between two different sets of laws of learning, namely, those of conditioning, and those of trial and error learning. Many attempts have been made to reduce both sets to a single system. It is not our present concern to decide whether or not such reduction can ultimately be made. The important points are that there are two different methods of modifying the behavior of an animal through experimental stimulation, and that there are certain marked differences between the generalizations which are drawn from the two methods. A complete description, whether operational or otherwise, must not neglect these differences. Perhaps the most important difference is that which is often formulated as the Law of Effect. This law was proposed to account for the fixation of successful responses and the elimination of unsuccessful ones. It has been seriously criticized on the grounds of circularity (4) and of embracing several different elements (42). I know of no way to give it precise objective formulation, for it involves such terms as 'successful,' 'satisfying,' or 'adaptive,' [2] but despite its lack of objectivity, the law seems to refer to certain phenomena that are important. In other words, the concept of effect, despite its inadequacies, seems to be an essential one in the description of trial and error learning, at least at the present stage of our knowledge.

Fortunately, no reference need be made to effect in our statement of the laws of the conditioned response. The first of these laws would indicate that paired presentation of a new (conditioned) and old (unconditioned) stimulus, under certain intensive and temporal conditions, leads to the development of a conditioned response. A second major law would indicate that the repeated presentation of the conditioned stimulus without the unconditioned one leads to a weakening of the conditioned response (experimental extinction). These two laws were first proposed by Pavlov, and have received repeated verification. If one wished to plan an experiment to

[2] For example, Warren's Dictionary states the law thus: "effect/law of = the principle that a successful or satisfying outcome of a response tends to strengthen its association with antecedent stimuli, and that an unsuccessful outcome tends to weaken such association."

study the detailed operation of these laws, he would be particularly careful to control the intensive and temporal characteristics of the stimuli which he planned to present to the animal. He would, therefore, arrange his apparatus so that the conditioned response *could not* increase or decrease the effectiveness of the unconditioned stimulus. In dealing with shock, for example, he would deliver the unconditioned stimulus without regard to the 'success' or the 'failure' of the animal to withdraw the forepaw. For a response which prevented the shock would be expected to lead to extinction (**14, 37**), and a response that shortened the duration of the shock should make it less effective as a conditioning agent. This is exactly opposite to what one would expect from the law of effect, in which 'successful' responses are fixated.

Theoretical consideration, therefore, would lead us to avoid any possibility of success or of failure in a conditioning situation. To what extent has this practice been followed in the large number of experiments that have supposedly been carried out by the conditioning method? Let us make a survey of such studies, and attempt to see whether or not 'success' is relevant in each of them. Our criterion of success or failure of the conditioned response will be the effect the response has on the unconditioned stimulus.[3] Further, whether or not a response is to be called 'successful' will depend upon the nature of the unconditioned stimulus. Thus, a conditioned response will be considered successful if it prevents or terminates a 'nociceptive' unconditioned stimulus, or if, on the other hand, it leads to, or increases, a 'beneceptive' unconditioned stimulus. Conditioned responses will be 'unsuccessful' in the reverse cases. Unfortunately there is no very good way of deciding whether a given stimulus is

[3] This discussion will be concerned *only* with the success or failure of conditioned response in the particular experimental situation in which it is established. We will not be interested in questions as to the adaptive value of the principles of conditioning, the general utility of the unconditioned response, or the possibility that the conditioned response will be useful in other situations. For example, if the apparatus is so arranged that the rat cannot avoid the shock by lifting its foot when the buzzer sounds, this response is not successful, and cannot be expected to be fixated by the factors subsumed under the law of effect. The fact that the animal often avoids a painful stimulus by lifting its foot is irrelevant to the discussion.

nociceptive or beneceptive. These terms are used because they are a bit less objectionable than others that might be employed. Despite the lack of objectivity of the terms, it is quite clear that careful observers would agree on extreme cases, such as the successfulness of a response that avoids or lessens a shock, and of the reaction that obtains food (or more or less food) for a hungry animal. There will also be cases in which observers would be less willing to agree on the adaptive value of the response, and perhaps some on which many would agree that the concept of success is quite irrelevant. With these facts in mind, we may now proceed to examine the conditioned response experiments, and make somewhat tentative judgments as to whether or not the conditioned response influences the unconditioned stimulus in a way that most observers would characterize as 'successful.'

The conditioned eyelid reflex, as studied by Hilgard and Marquis (**12**), would be judged quite successful in avoiding the puff of air that served as the unconditioned stimulus. It is also probable that a conditioned closure of the lid would decrease the stimulating value of a tap delivered to the lower lid, which served as the unconditioned stimulus in experiments performed by Switzer (**41**) and by Shipley (**39**). It is more difficult to see the adaptive value of the conditioned lid reflex in the specific situation utilized by Cason (**3**), where a shock to the cheek served as the unconditioned stimulus. Finally, most observers would probably agree that the conditioned lid reflex in Hilgard's original experiment (**10**) was non-adaptive as far as that situation was concerned. Closure of the lid in response to the conditioned stimulus, a light, could certainly have had no effect on the unconditioned stimulus, a sharp sound. It is not implied that the conditioning process which makes such reaction possible has no adaptive value in general, but rather that, in this particular situation, the conditioned response developed can be called neither successful nor unsuccessful. In other words, one cannot say that the law of effect, as stated above, is pertinent to this experiment.[4]

[4] See footnote, p. 381.

The knee jerk has been conditioned by a number of experimenters. The successfulness of the conditioned knee jerk would seem to be as near zero as one could imagine. As a matter of fact, I chose this reflex for my first study of the conditioning process (31) because it seemed unlikely that human subjects would complicate the situation by verbal decisions as to what they should do. I have suggested, however, in another paper (32) that such complications do come in and obscure the conditioning process. We must consider not only the effect of subtle attitudes (30) and self-administered instructions but also the fact that the conditioned response may either increase the effectiveness of the tap on the tendon, by making it more taut, or may decrease its stimulating value by causing the hammer to hit the shin of the extended leg, depending upon the height of the early kick. Considering these complications, most observers would agree that the law of effect is not unambiguously applicable to the conditioned knee jerk.

Now let us turn our attention to the so-called 'alimentary' reflexes. In Pavlov's (26) laboratory and in the others in which his technique is used (27) the organism under investigation receives food whether it salivates or not. In this sense the conditioned response is neither a success nor a failure. But it is possible that the copious conditioned secretion of saliva enhances the stimulating value of the dry meat powder usually used as the unconditioned stimulus. In that respect, the CR might be called adaptive. However, we would probably find our observers in disagreement as to whether or not this conditioned response should be called successful. They might be more nearly willing to agree to the adaptive value of conditioned salivary secretion based upon acid as the unconditioned stimulus, for the saliva dilutes the acid and decreases its stimulating value. They might also be willing to agree to the *lack* of adaptive value of conditioned feeding responses as established by Krasnagorski (20), Mateer (25), and Marquis (24), since the preparatory movements of the jaws, etc., did not determine whether or not the child was to be fed.

The conditioned iris reflex, as established by Cason (**2**), might be said to be successful in that it did prepare the eye for the change of illumination that served as the unconditioned stimulus. But the same cannot be said, without fear of contradiction, for the second- and third-order conditioned reflexes established on the same unconditioned reflex (**13**). And when we consider some of the other unconditioned reflexes that are related to the autonomic nervous system such as vomiting, urination, diuresis, defecation, and immunity reactions, it becomes quite futile even to attempt to evaluate the effects of the conditioned response on the unconditioned stimulus.

Let us turn now to a discussion of the conditioned reactions based upon shock. The papers [5] devoted to experiments with these responses probably outnumber those devoted to all other types of conditioned reactions. The responses to shock may be grouped under two classes, namely, those responses, usually of skeletal muscle, that would remove the member from the locus of the shock, and those reactions of muscle and gland that result from the shock but are not specific to the shocked area. The former are called 'withdrawal' or 'flexion' reflexes or responses and are sometimes classified as 'defense' reactions. The less specific reactions have no convenient generic name. They include various changes in the breathing rhythm,[5] pulse rhythm,[5] electrical skin resistance,[5] body volume,[5] pitch of voice,[5] and tonic change (**23, 35, 37**). Such responses may be referred to as emotional, attentional, anticipatory, or preparatory. They 'condition' rather readily. But they probably do not materially modify the effectiveness of the unconditioned stimulus, even though they may occur as conditioned responses before the unconditioned stimulus. Their success is debatable, in the particular situation in which they are elicited. It may be true that increased tonus makes it possible for the organism to react more promptly to the shock, but increased tonus, of itself, does not prevent the shock. As a matter of fact, the work of Jacobson (**17**) makes

[5] No attempt will be made to list all such studies here. See Razran (**27, 28, 29**) and Hull (**15**).

it seem likely that increased tension or tonus actually increases the effectiveness of the shock. Therefore, the writer believes that these reactions do not offer a really clear-cut example of 'effect.'

If we turn, however, to the actual withdrawal of the stimulated member, the situation is very different. A conditioned withdrawal, if it occurs soon enough, may completely prevent the shock, *if* the electrodes are not attached to the stimulated member. The organism has been free to remove its member from the shocking grill in practically all of the conditioned response studies utilizing the withdrawal response with human subjects. Bechterev used a key with two electrodes to deliver the shock (1). Watson, who introduced the method to this country, designed an apparatus with an indifferent electrode under the palm and a stimulating electrode at the finger-tip (44). The numerous experimenters who have followed these pioneers continued to use electrodes from which the hand would be withdrawn in response to the shock. The law of effect seems quite pertinent to these studies, for the conditioned response is successful if it prevents or terminates the shock. This is especially true if the conditioned stimulus is presented soon enough to permit the withdrawal of the member before the stimulating current flows through the electrodes.[6] Then there is the further consideration of symbolic processes. The human subject may integrate the instructions, the immediate stimuli, and the possible responses at a verbal level, and then decide on the response to be made (5, 9, 46). Hence, Razran is probably correct when he says, ". . . its (the withdrawal response to an electric shock) general value as a method for the discovery of the laws of conditioning in adult human beings is very limited" (29).

If we turn to the consideration of this reflex in animals, we no longer have the same difficulties with instructions. But we do find two distinct methods of presenting the shock. A number of studies have been made in which the shock is

[6] Where conditioned and unconditioned stimuli are presented simultaneously, the application of the law of effect is less clear, for the unconditioned reaction to the shock, because of its short latency, will remove the member from the electrode before the conditioned response can occur.

delivered through a grill from which the animal may withdraw its shocked, or to-be-shocked, member. In these experiments, the law of effect might be expected to operate. The same is true for the experiments in which the electrode is attached to the animal, but the shock is terminated by the response through the use of a switch. This latter method has been used by the present writer (**35**), by James (**19**), and by Culler (**6**). In other experiments, the electrode is attached to the leg and the shock is presented whether the animal responds to the conditioned stimulus or not (**23**). In the latter experiments the law of effect seems irrelevant. It seems to the writer that these latter experiments are more in accord with the usual definition of the conditioned response. For example, in Warren's dictionary we find the following: "conditioned response = a response, whether simple or elaborated, which, though originally not arousable by a given stimulus, has come to be arousable by it as a result of simultaneous or nearly simultaneous presentation of the latter along with some stimulus that had been potent to arouse the response in question."

According to this definition, which is quite typical, temporal contiguity of stimulus and response is the significant factor in describing the conditioned response. It would seem, therefore, that any situation in which the conditioned response materially affected the unconditioned stimulus, thus involving additional factors, would not be a typical conditioned response. This distinction has not often been made.[7] The present writer has already suggested it briefly (**35**, p. 322).

[7] It is worth noting that most experimenters who have used flexion as the unconditioned reflex have tacitly assumed something akin to the law of effect by using an unattached (and hence avoidable) electrode. On the other hand, those who have been most interested in breathing, galvanic skin reactions, etc., have tended to use an attached electrode, administering the shock regardless of the response. This is most clearly illustrated in the work of Watson (**44**). When he studied the withdrawal of the hand or foot, he used an unattached electrode and even referred to the shock as 'punishment.' But when he studied only breathing reactions, as in birds, the electrodes were firmly attached to the animal, and the shock was delivered every time. But, to the writer's knowledge, no experimenter had even mentioned that these two techniques were different, much less demonstrated the advantage of either, prior to the first paper of this series (**35**).

Skinner, in a recent paper (40), has clearly analyzed two types of simple stimulus-response situations and differentiated between them. His Type II conditioned response is clearly *the* conditioned response as defined above. Skinner also described a situation in which one response leads to another stimulus response sequence. He chose to call the behavior resulting from such situations conditioned response Type I. The present writer would prefer to call such situations by some other name, such as 'problem-solving,' to avoid confusion. But he is completely in agreement with Skinner in separating the two types of situations. Both Skinner [8] and the present writer believe that a situation such as that used to establish the conditioned withdrawal response in man and that used by Culler and by Hunter for animals are composites of both types of situations described above. That is, to say the original withdrawal is a result of simple conditioning, but it is fixated by its success in avoiding the shock. That this fixation occurs is demonstrated by Culler's and Hunter's reports that learning develops more rapidly under the avoidable shock situation than it does under the fixed shock of more typical conditioning situations. Thus, 'effect' seems to mask or counterbalance the extinguishing effects of the omitted reinforcements, to such an extent that the response is actually fixated more rapidly than it is under regular reinforcement.

In some experimental situations, then, the conditioned response cannot be considered either successful or unsuccessful, since it cannot affect the unconditioned stimulus. This would seem to be the conventional type of conditioned response. But in other experimental situations the response has the possibility of being successful, and of modifying the unconditioned stimulus (gaining a reward, or avoiding a punishment).

It will be noted from what has been previously stated that those conditioned responses to which the law of effect seemed most clearly irrelevant were largely of a tonic or diffuse nature, and that in general they prepared the organism for future action. It is these responses that seem to condition most

[8] According to private communication.

readily and regularly as has been proven in the conditioning of breathing, glandular secretions and galvanic skin responses. (Indeed, this idea was held by Pavlov, as shown by his use of the term 'signal reflex' as a synonym for conditioned reflex.) For example, Razran, in his excellent review of conditioned responses in children, concludes (**27**, p. 99), "A response involving wide-spread bodily action (emotional?) is faster conditioned than a response concentrated in few effectors." This conclusion is based upon a fairly large number of studies. Liddell finds that "When a new conditioned reflex is being established movement of the head, in conjunction with the respiratory and psycho-galvanic reactions to the approaching shock, is always observed before the anticipatory movement of the foreleg appears" (**23**, p. 45). He also indicates that the diffuse responses are more susceptible to experimental extinction than are the more specific ones. Similar results for the rat have already been reported (**35**).

Other points in favor of this view can easily be found. Thus, the fact that the conditioned response tends to occur before the unconditioned stimulus almost invites one to call it 'anticipatory.' Finally, the differences between conditioned and unconditioned responses argue in the same direction (**37**, **45**, **10**, **11**, **35**).

Now consider those responses to which the law of effect seems most relevant. They are all of the type in which the organism does something to the reinforcing stimulus. Thus, in a maze the animal actually approaches food, or gets off a charged grill. This type of behavior may conveniently be called 'problem solving.' The present writer would place the experiments of Hunter and of Culler and Brogden [9] in this class.

It is thus possible to make a rough, and perhaps superficial distinction between diffuse preparatory responses, to which the laws of conditioning apply in a direct fashion, and precise adaptive responses, in which the law of effect seems relevant. The distinction, in common with most of those that are drawn in the biological sciences, is not to be construed too rigidly.

[9] See p. 380.

Further, it is quite possible that the distinction is not an ultimate one, and that the facts referred to under the law of effect may eventually be reduced to terms of conditioning (**8, 15**). But the distinction has some merit in ordering certain of the experimental results obtained in the field of learning.

If the distinction is applied to the conflicting results that were described at the beginning of this paper, it becomes apparent that *all* of the responses in the writer's experiments must be classed as tonic or diffuse. For breathing, tail lashing, and squealing, this is a very satisfactory description as far as the present writer is concerned. The nature of the leg withdrawal is not so obvious. It would seem at first glance to be specific, and the question immediately arises as to why the rat cannot learn to 'solve the problem' of avoiding the shock by a foreleg flexion. The clue to the answer may be found in some observations made by James (**18**). He reported that there was great difficulty in establishing a foreleg flexion in guinea pigs, but that they learned to run from a shock with relative ease. It seems difficult in the rodents studied to isolate the foreleg flexion from its larger whole, running away. If the rat is restrained in a holder, it cannot run, and becomes frightened and excited. The foreleg response remains a response preparatory to running away, instead of being isolated as a precise adaptive response. The rat can develop specific foreleg responses in other less exciting situations (*cf.*, Skinner's lever situation). Higher mammals, such as dogs, can develop precise foreleg reactions even when restrained in a holder, and the law of effect seems to apply as well in these situations as it does to those where rats are free to run.

Further light is shed on the problem by the results of Culler and his associates (**6, 7**) on conditioning in dogs. A normal dog passes through two stages in his training. At first the conditioned response is diffuse, widespread, and violent. Gradually the precise foreleg response develops, just strong enough to avoid the shock. The authors refer to this final stage of conditioning as 'adaptive.' A decorticate

dog is not able to reach this stage, never getting beyond the level of diffuse, 'massive' conditioning. Thus, the behavior of a decorticate dog seems to resemble rather closely that of the normal rat in the writer's experiments. This immediately suggests that a certain degree of cortical development is necessary for the formation of precise adaptive responses. The rat has a cortex which is adequate for the development of adaptive behavior of the whole animal, such as running to avoid shock. But it is not sufficiently differentiated to permit the breaking up of this behavior into segmental responses, such as the lifting of a single fore-paw to prevent the shock. The fore-paw movement remains part of the larger response, and cannot function separately as an adaptive bit of behavior.

The implications of this discussion are worthy of some brief attention. In the first place, it has indicated that there is a type of modification of behavior which depends solely on the paired presentation of a conditioned and an unconditioned stimulus. The progress of this modification will depend upon the number of pairings, their temporal and intensive characteristics, and upon the condition of the organism. Further, this modification may be broken down by the repeated isolated presentation of the conditioned stimulus. This type of modification makes rather meager demands on the nervous system, and may even be established in decorticate animals. But in certain situations, higher animals may show behavior which is superficially inconsistent with these principles. A second process seems to cut across, preventing extinction, and resulting in the rapid fixation of the successful response. This second process is covered by the law of effect. It seems to be dependent on a more highly developed nervous system than does simple conditioning. Since this latter type of modification shows certain 'operational' differences, it is suggested that it be given a separate name, as 'trial and error learning,' or 'problem solving,' and should not be called 'conditioning.'

A second general implication of this discussion may be pointed out, although this is not the place to develop it further. It seems quite possible that the diffuse anticipatory responses which result from conditioning of the sort carried

out by the writer are the correlate of the 'expectancies' of Tolman (43), and of comparable concepts developed by others. Indeed, after explaining the experiments to his non-professional friends, and describing the conditioned inspirations, squeals, and leg movements, the writer has often been told, "You mean that the animal comes to expect the shock." Thus, it seems possible that the distinction between the diffuse conditioned responses, and the more precise adaptive responses established by trial and error, may well give an objective basis for the distinction between learning and performance which has been proposed by certain writers (21, 22). This is, of course, suggested as a very tentative hypothesis, and not as an essential part of the present paper.

Summary and Conclusions

1. In certain shock situations 'success' seems to fixate the response which prevents the shock. In other situations, successful avoidance of the shock leads to extinction. One result is consistent with the law of effect, while the other agrees with the laws of conditioning.

2. A large number of different conditioning situations were surveyed. In many cases the concept of success seemed quite irrelevant, since the conditioned response could not modify the unconditioned stimulus. These are examples of simple conditioning. In other experiments there was the possibility that the 'law of effect' would cut across the simple conditioning. These experiments might well be referred to by a different name, as trial and error learning, or problem solving.

3. Conditioning is particularly effective for diffuse anticipatory responses, and apparently demands a less complicated nervous mechanism than does the precise adaptive behavior involved in problem solving.

4. Since these two methods of modifying behavior seem markedly different, at least at a superficial level, clarity of contemporary thought demands that they do not both receive the name of 'conditioning.'

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A THEORY OF BALL-PLAY

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Since the various theories of play deal primarily with pretense-activities such as a dog's romping or a person's 'playing millionaire' or 'playing soldier,' [1] there is wanting a theory of ball-play. Evidently, the important thing about a ball-game such as golf is neither pretense nor the spilling over of surplus energy. We shall in this essay, therefore, outline a theory of ball-play, where 'ball-play' means any sport involving the projection of a missile with a view to accuracy at a distance—in short, the play of marksmanship.

The new treatment involves two basic terms which had better be defined at the start: 'native body' and 'acquired body.'[2] The 'native body' is the physiological organism at *any* stage of its development, and its members are such items as hands, feet, etc. The 'acquired body' is any physical object or set of such which, while distinct from the native body of the agent, serves the agent with the same unconscious or habitual precision as its native members. Members of the acquired body are such items as hammers, automobiles, golf clubs and balls, etc. An automobile, for example, becomes part of an agent's acquired body when he operates it with the unpremeditated, unerring ease with which he uses his legs for walking. As a pedestrian, all he need consciously do is to have in view some destination, and the pedal locomotion takes care of itself. So with the skilled motorist whose car has 'become a part of himself.' He 'gets there' automatically, where 'he' stands not only for a physiological organism but for something spatially more comprehensive, including rubber,

[1] See R. B. Perry, General theory of value, New York: Longmans, Green, 1926, pp. 251–259.

[2] Part of what William James called the "empirical self," Principles of psychology, Vol. II, New York: Henry Holt & Co., 1890, pp. 291 ff.

gears and gasoline. The following description is culled from an English sportsman's diary:

> I tell you, when I get into this inanimate bundle of parts called automobile, it becomes animate. It acquires a nervous system. Contacting it at this and that point with the tips of my fingers and the palms of my hands and the soles of my feet, the thing people call my body takes on larger proportions. Metal, grease and paint enter into the substance of my organism, and muscle and tissue go out to vitalize the whole. The peripheries of my body become tire and bumper. A nail in the tire is a thorn in the flesh, and a broken spring is a broken bone.
>
> And when this great body of mine races out into the prairie through the purple and crimson mists of early morning, I listen to my iron lungs suck in the moist air and exhale it in oil-odorous purrings, while the dew-laden road beneath me sings.

The thesis of this essay is that the marksman's play is the activity, enjoyed for its own sake, of developing and exercising an acquired body having an accurate distance-reach beyond that of any member of the native body. *Why* such a spatial extension of one's body is pleasant is a question more fundamental than the one we are here considering, namely, the question concerning the nature of the play of the marksman. The answer to this less fundamental question is the thesis proposed above, and remarks designed to round it out and show its plausibility follow below.

Sight is a sort of 'anticipative touch.'[3] The organism which visualizes an object is in the kind of communication with it which might be called 'touching-at-a-distance.' And to see an object involves two phases: the phase of bridging a spatial interval without annulling it,[4] and the phase of 'fixating' or visually 'touching' the object. (The poet Tagore says, "I have kissed this world with my eyes.") The community of

[3] O. L. Reiser, Philosophy and the concepts of modern science, New York: Macmillan, 1935, p. 79.

[4] *Cf.*, A. O. Lovejoy, The revolt against dualism, Chicago: Open Court Publ. Co., 1930, p. 315. Replacing 'knowing' by 'vision,' we get the following quotation: "Essentially, vision is a phenomenon by which the simple location of things is circumvented without being annulled."

organism and object thus established is not physical but what, for want of a better word, might be called 'epistemic.' The various colors of an object thus touched at a distance are its 'visual temperatures,' just as the hot or cold felt by actual physiological contact are its literal temperatures.

Since vision is the ability to touch things at a distance or to experience them without cumbersome propulsion of the native body to make physical contact with them, by the mere act of seeing one enjoys a potential spatial extension of the self, where the 'self' is in part the visual field of awareness. Thus it is that in moments of esthetic visualization of a distant object such as a blue mountain towering up into view from below the horizon, the seer has a thrilling sense of expansiveness and of embracing, *within* his field of vision, the remote landscape. He touches it, prehends it, with his eyes, though physically it is far beyond the reach of his native arms. By visually contemplating the scene, he becomes epistemically conterminous with it. By an epistemic stretch, he reaches forth to touch it at a distance. Illustrative of this sense of expansive being by means of vision—or of an acquired body if the scene is familiar—is the following passage, quoted from the same diary:

> Stranger, when you appeared on the horizon there miles to the east, a speck silhouetted against the dawn, you stepped on my toes and bumped into me. Did you not feel the impact?
>
> Before you appeared this whole expanse was my body, and the light and the colors in it my mind. Then the collision occurred. Now look at me. My body is shrunken to a midget-trunk with four midget-limbs. And my mind is in a skull.
>
> I felt the impact, Stranger. I bid you good-morning—and heartily farewell.

But the zest of this activity of anticipative or purely epistemic touching may be enhanced by *physically* demonstrating or playing with it. Not by establishing simultaneous physical continuity between the seer and the seen such as, for example, would obtain were he to touch the object with a long

stick. Such contact would not represent the sort of touching which occurs in vision, which is touching without rigid physical linkage between the organism and the object. (Threading a needle is perhaps an exception-in-minature, where it is played with or enjoyed for its own sake.) The visual process is best represented in a physical dimension by ball-play, the term 'ball-play' meaning—by definition for present purposes—the activity of projecting any kind of missile with an eye to accuracy at a distance. (Thus shot-putting or hammer-throwing, though forms of projectile-play, are not here in consideration, since the distance-factor and the exhibition of strength only are involved; accurately touching something at a distance is not their aim.) In a sense, therefore, he who engages directly in ball-play or in the performance of marksmanship is indirectly playing with his ability to see, where seeing is epistemic touching at a distance. And, in order thus to play with sight, one must develop an *acquired body* with whose various members he actually—not merely potentially or epistemically—touches things remote from his native body, without rigidly bridging the spatial interval.

Comments on some ball-games picked at random will further elucidate this thesis.

Golf. The two phases of vision have already been observed, namely, a reaching out to cover distance without annulling it and a fine touching. These distance- and contact-factors are equally emphasized in golf, perhaps as in no other games except archery and rifle-shooting. Each phase is enjoyed for itself; the *physical* flight of the ball is the means of enjoying an *epistemic* flight or reaching out, and the ball's approximation to a small hole affords the pleasant sense of an epistemic 'perch' or accurate touching-at-a-distance. Now in order to get a genuine sense of contacting the hole at a distance, the ball must be experienced as a part of the player's body. It must be felt as a kind of organ which performs the touching-function by extending at will in the desired direction. This feeling of having acquired a greater bodily reach is realized when the ball seems to manifest the directive presence of the player *during its flight* as well as at the *terminus ad quem*.

or, in general, when the ball is no longer in the immediate vicinity of his native body. The thrill produced by a ball curving in its flight to circumvent a tree between the player and the pin is simply the thrill of exercising an acquired body one of whose members is the ball (the club another). By watching the ball obediently follow the aerial groove visually traced, the player gets the sense of regulating it during its flight or at a distance, in the same way in which he regulates the movement of his native hand in reaching for a glass of water. The ball becomes a part of the expert player's body, and with it he contacts the distant mark. He touches it with an elongated organ. And the chagrin he feels at an awkward gesture of an acquired bodily member (club or ball) is precisely what he feels when a native member bungles (upsetting a glass of water). The exasperation resulting from a ball flying wild is natural to a good golf-player, because it is a case of losing momentary control over a member of his own body. The majority of the most irate players—and the best players are those who have learned to control their irritation—are those whose anticipative touch (visual contact with the mark) is so sensitive and sure that they cannot stand or understand a single instance of failure to demonstrate it physically by ball-play. Even before or independent of the stroke with the club, they touch the mark surely with their eyes, such that to miss it with the ball seems a vexingly unnecessary accident. (Much of the accurate touching-at-a-distance in golf consists in making the right contact of club and ball, though of course this is instrumental to making the more remote contact of ball and hole.) The man who is in no wise nettled by a bad shot is so lacking in sympathy with inanimate objects that he is unaware of his epistemic community with them in vision and of the possibility of assimilating some of them into his own corpus in order to enhance the fun of such contact by ball-play. The expert golfer, on the contrary, is so one with his club and ball that he uses them as unconsciously and effectively as he does his arms or legs and is keenly aware only of the direction to be taken and the distance to be covered. Ball and club have become active members of his body, and

he need have in view only what he wants to make contact with. The rest takes care of itself, as in the case of the expert motorist whose body takes on the proportions of an automobile.

Billiards. In this game, even more than in golf, the behavior of the ball from the time it leaves the cue to the time it comes to rest is the prime factor. A skillfully cued billiard-ball behaves like an animated thing throughout its course. It steers itself, pulls itself, brakes itself, kissing another ball here and pushing itself away from a rail there, until it smugly stops in a position favorable to the player and distressing to his opponent. At first sight an observer suspects sorcery. And indeed, there is magic in it—the magic involved in any case of seizure-at-a-distance. It thrills the player himself to observe his prior visual intention or epistemic reach manifest itself in the behavior of something physically disconnected from his native body. He has developed an acquired body one of whose parts plainly shows, at a distance, its membership in his spatially enlarged self.

Rifle-shooting. This is probably the sport in which the factors of sheer distance and hair-splitting accuracy are most prominent and most equally emphasized. And it is most like vision, in as much as in neither the visual nor ballistic remote-touching is there a visible passage of a projectile from the native body to the object or in the opposite direction. Moreover, as the act of looking and the visual remote-touching seem to occur simultaneously, so the firing of the shot and the arrival of the bullet seem almost simultaneous. There is no enjoyment of a flight or passage in either case, due to the absence of a sensible projectile. One is aware only of a distance-reach and a precise touching.

The hunter who is also a marksman is generally more marksman than hunter. That is to say, the satisfaction he gets out of hunting has little to do with hunting and killing. It has more to do with the sheer fun of touching or piercing with a pointed metallic finger—involving rifle and bullet—anything he can see (touch) with his eyes. This, again, is playing in a physical dimension with one's ability to see. It is the *physical* enjoyment of the insubstantial touching

which is characteristic of sight. Below is another passage from the sportsman's diary:

> Have you ever held a fine rifle in your hands? There is something staggeringly poetic about it. The way the copper-tipped bullets nose themselves, at each moment of bolt-action, into the bottle-necked explosion-chamber; the contented cluck of the bolt driven home against oily surfaces; the clear crack that expands quickly out and is absorbed into the open plain; then the noiseless ejection of the shell which, spinning through the air, catches the sunlight and gives it to the eye in brilliant bits. . . .
>
> Yes, all this is beautiful. But what thrills you most is, that when a fine rifle is put into your hands, you acquire a sixth sense. It is somewhere between seeing and hearing. Less swiftly than light, but swifter than sound, the rifle communicates you with any point within a radius of a thousand yards. You but press the trigger and there, half a mile away and almost at the same instant, goes up a puff of white dust where you scratched the plain with an elongated and steel-jacketed finger.

The thoroughbred marksman usually holds a shot-gun in contempt. A shot-gun is a concession to one's inability to shoot as pointedly and as far as he can see. The ideal of marksmanship is to make the physical touching measure up to the visual in distance and accuracy. The true marksman demands of himself that he be able to touch, with some member of an acquired body, any discriminable *point* in the field of vision, without touching anything else at the same time and regardless of whether that point is in motion. Certainly, hitting with a single bullet a clay pigeon or, worse, a teal in ninety-mile-an-hour flight is an ideal seldom if ever realized. But nevertheless it is the ideal of the rifleman and possible of fulfilment, since both these minute objects are visually prehensible even as they fly, and are not beyond the range of his 'steel-jacketed finger.' The fulfilment of the deal depends upon the degree to which the rifleman *incorporates* rifle and bullet, by making them efficient members of an acquired body.

Archery. This sport resembles that of rifle-marksmanship, with the additional factor that the *flight* of the arrow, the

traversing of the distance, contributes to the satisfaction. The archer sees himself extend into space by watching the reaching-gesture of a member (arrow) of his acquired body.

Tennis and ping-pong. The ball-games hitherto considered can all be played by a single player. In them, the main endeavor is really competition with the self on the basis of old scores, the aim being a record-breaking incorporation of the requisite physical apparatus into an acquired body, for purposes of precise physical touching-at-a-distance. In tennis or ping-pong two or more players play at the same time with the same ball. The aim, therefore, is simultaneous, competitive incorporation of a single object into an acquired body. He who is most able to develop an acquired body finally preëmpts the ball and wins. In the end, the score shows that the tennis-ball has been more subservient to the distance-reach of one of the players (or of one of the teams). The tennis-player is not only concerned with accurate touching-at-a-distance as in games of pure marksmanship, but he touches at a distance ('places' the ball) with the ulterior aim of evading the reach of an opponent who is also striving to incorporate the same ball as a member of his acquired body. Thus, in tennis or ping-pong, the play involves the friction of two or more acquired bodies coming into conflict in their attempt to monopolize a single object as a bodily member. Tennis is a sort of wrestling-at-a-distance.

Football. Since power and deception are the two fundamentals of American football, it is not played so much for the fun of accurately touching at a distance. In proportion, however, as the ball is put into aerial play, by hand or foot, this factor does become operative as in tennis, the end being competitive incorporation of the ball, where the competing bodies are the two teams. People who find American football uninteresting measure it by the sole standard of marksmanship, involving precise distance-touching.[5] They complain of the lack of aerial play and display. Association football, or soccer, is more to their liking, its principle of play through-

[5] Marksmanship becomes *the* fundamental of American football if it (marksmanship) is conceived, as it well might, to include the accurate projection of one's *native* body, as when it is hurled through a hole in the opposing team's line. Vision here still is involved, but not the physical touching-at-a-distance.

out being identical with that of tennis, some superficial differences being a larger number of players, the use of feet and heads instead of racquets, and goals instead of a net.

Discus- and javelin-throw. These projectile-games might be mentioned in conclusion, being borderline cases of ball-play as defined at the start. In them, the precision-factor is wanting. The play-satisfaction they yield, however, is distinct from that of shot-put or hammer-throw, though distance in each case counts. The difference is that the behavior of the javelin or discus *during its flight* is a means for the player to enjoy in a physical dimension the expansiveness or spatial reach he enjoys in vision. He sees himself extend and reach into space as he watches the javelin assume the right tilt and change it according to the stage of the flight, to prolong it. And something similar may be said of the flight of the discus. But this quality-of-the-flight consideration does not hold of the passage of, say, the hammer through the air. That, as in the case of shot-putting, does not count and does not give the thrower that sense of controlling seizure-at-a-distance which is the mark, and the main part of the fun, of all ball-play.

To epitomize: by seeing, one circumvents the 'simple location' of his native body without physically annulling it; one enjoys a clear-cut, colorful existence beyond the peripheries of his native body. (It was not the concern of this essay to explain the details of this visual process.) And one plays with or enjoys this marvelous distance-experience by becoming a marksman—by playing ball. One touches something at a distance with his eyes, and then with a ball. This latter physical touching-at-a-distance 'substantiates' the epistemic touching without denaturing it. At first, as a child, one tosses and rolls the ball, enjoying only its random 'flight' or passage-factor in the field of vision. Later, the demand for accuracy and distance arises, since these also are characteristics of mature seeing. The demand is met by the player's developing an acquired body, the most important member of which is a ball.

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DOMINANCE–FEELING, BEHAVIOR, AND STATUS [1]

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This paper has several purposes. (1) It will present briefly the heuristic system of definitions and concepts relative to dominance in human beings that has arisen as a product of experimental researches in dominance in human beings and infra-human primates.[2] It appears to the writer that this conceptual framework is more useful than other discussions of will-to-power, dominance, power drive, etc., and has the inestimable advantage of being an *experimental* product of work with normal subjects rather than a clinical or philosophical one. Neither is it a product of any urge to system-building. It is therefore less apt to be distorted factually by the sort of esthetic architectonic that hates inconsistencies or unsolved problems and attempts to fit them to the Procrustean bed of an *a priori*, prearranged theoretical scheme.

(2) It will present discursively some of the broader conclusions arrived at as a result of these researches.

It has been found necessary to distinguish between the following and to treat them as separate psychological data: dominance-feeling, dominance behavior, dominance status, craving or desire for dominance, feelings of inferiority and

[1] I wish to express my thanks to Drs. E. L. Thorndike, G. Murphy, L. B. Murphy, S. Asch, Miss Neva Lowman, and Miss Ruth Ritzman for useful suggestions and criticisms. This study is one item in a program of research supported by a grant from the Carnegie Corporation.

[2] In a series of papers on dominance in monkeys, (12), (13), (14), (15), (16), the interested reader may trace for himself the struggle to approach some useful definition of dominance. The definitions employed here, however, could not have come from work with either humans or animals alone, but were made with reference to the comparative facts in both. While fuller reports of the work with humans will be published in the future, it may be well to give a very brief indication of the technique used. About 100 women and 15 men, most of college age and intellectual calibre, were studied very carefully by means of long, intensive interviews that attempted (1) to understand the whole personality of the subject, and (2) to understand the role that dominance played in this personality picture.

superiority, matter-of-fact superiority and inferiority, and compensatory dominance behavior. This paper will be built around the discussion of these concepts and the demonstration of the interrelations between them.

I. Dominance Status and Dominance-Feeling

Dominance Status.—It may be readily observed in pairs of human beings that, in a good many cases, one member of the pair will dominate the other. He will lead, suggest, order or inhibit the behavior of the subordinate one. The latter will often defer to the wishes of the dominant one, and respect him more than the dominant one respects *him*. In a marriage, for instance, in which the wife definitely and strongly dominates the husband, her opinion will usually prevail whenever there is any conflict; she will be more forceful and direct in the expression of her opinions than he will. In their social relationship, she is more confident in her behavior, gets what she wants more often than does the husband, feels superior to him, generally feels herself to be stronger than he is, and respects herself more than she does him. Her behavior, depending on the kind of dominance, is apt to express either (1) condescension, contempt, impatience, irritability, (2) pity, tenderness, protectiveness or good-natured toleration, or (3) aloofness and superiority.

The husband's behavior will express inferiority, deference, child-parent attitude, respect, 'looking up to,' willingness to concede. He *asks* rather than *tells* in his conversation and is apt to change his opinion if his dominant partner questions it.

If, however, we examine the further social relations of these two people, we find that she may stand in exactly the same relationship to certain other people as her husband stands to her, that is, other people may dominate her. Also we shall inevitably find that there are some people to whom the husband stands in a dominant relationship. He will now behave and feel in these relationships, approximately the same as his wife behaves and feels with respect to him.

It is this kind of relationship to which the terms 'dominance status' and 'subordinate status' refer. They may be

more exactly defined as follows: *in a social relationship between two people, in which one dominates the other either overtly in behavior, or implicitly in feeling, the one who dominates is said to be in, or to have, dominance status. The other is said to be in, or to have, subordinate status.* While this kind of relationship does not *always* obtain in social pairings, it is very common in our culture. (See below for equality status, 'split dominance,' etc.)

Dominance status is then a relative thing. It refers to the particular relationship between two particular people.[3]

It is necessary to go behind these facts to another very interesting fact, namely, that some individuals dominate practically all the people they meet, and that other individuals are dominated by practically all the individuals they meet

[3] There are at least two broad types of dominance status. Further sub-distinctions might be made, but for our purposes these two are most useful. The first is the kind we find in infra-human primates in which all those factors called 'cultural' play little or no part. This is the face-to-face, man-to-man situation in which two personalities are weighed on their own merits, without any superficial cultural advantages accruing to one or the other because of wealth, money, social position, economic position, etc. Our description would hold mostly for this kind of determination of status in which simply strength of character decides the outcome of the sizing-up process.

However, we must also deal with cultural, social and economic status if we wish to complete the picture. There is no doubt that, in most of the instances in which human beings meet each other in the ordinary framework of society, such considerations are as important in determining the status relationship that will emerge as are fundamental strength of personality, forcefulness of character, etc. The man who has a distinguished title or who is known as a very wealthy man or as a man who employs many men and women—such a man has a tremendous advantage over a person who is his employee or one who is looking for a job with this man. The first type we might call 'face-to-face' dominance status, the latter, 'cultural' dominance status. In general, dominance-feeling will correlate highly with 'face-to-face' dominance-subordination status. It is likely to correlate less closely with 'cultural' status.

Another determining factor in the 'sizing-up' process is admitted by some subjects, namely, the *use* that this person can be to the subject in achieving his purposes. In other words, the perception of a person as a means to any of the subject's ends may influence the eventual determination of status. For instance, a person with high dominance-feeling meeting a person with low dominance-feeling may modify his dominance behavior considerably because this latter individual may have a father from whom a desired position might be obtained through his son's intervention.

It must be remembered that, as a result of the 'sizing-up' process, status is sometimes 'given,' sometimes 'taken,' and sometimes both, as is also the case with monkeys. We know also that being a stranger lowers the chances of achieving dominance status. This is true for animals and for humans.

(feel subordinate to them). If now, as the writer has done, one subjects many individuals of both these groups to long, careful individual study, by means of lengthy, intensive interviews, hypnosis, dream interpretation, questionnaire studies, observation of behavior, and the subject's own reports of his behavior, we find that we can distinguish types of a sort; we can speak of high-dominance people, low-dominance people and middle-dominance people. For each of these we can observe fairly definite syndromes of behavior and feeling that are generally characteristic of these people in most of the affairs of daily life. We have discovered that the differences in feeling and attitude are more important and characteristic than the differences in behavior (that is to say, much more can be predicted from a knowledge of dominance-feeling). We shall therefore refer chiefly to differences in dominance-feeling rather than differences in dominance-behavior when we speak of high- or low-dominance people.

Dominance-feeling.—It is at the moment impossible to define succinctly what is meant by the feeling of dominance or subordination.[4] Various near-synonyms are possible. Together with a list of sub-aspects of the feeling, these almost-synonyms can at least give a working idea of what the feeling consists introspectively. These are (1) self-confidence, (2) self-esteem, (3) high self-respect and evaluation of self, (4) consciousness or feeling of 'superiority' in a very general sense, (5) forcefulness of personality, (6) strength of character, (7) a feeling of sureness with respect to other people, (8) a feeling of being able to handle other people, (9) a feeling of masterfulness and of mastery, (10) a feeling that others do and ought to admire and respect one, (11) a feeling of general capability, (12) an absence of shyness, timidity, self-consciousness, or embarrassment, (13) a feeling of pride. These are

[4] Operationally defined, 'feeling' is what subjects say in the interview about their implicit, affective, and attitudinal responses. 'Behavior' is what we can see from the outside. Thus we may observe that a subject is rather aloof and snobbish in her *behavior* at a party; later, in response to questioning, she may say that she *felt* shy and unwanted. 'Feeling,' so defined, is of course entirely on a conscious level. No interpretation or symbolic analysis is involved. What the subject *says* is the psychological datum used, that is, of course, if good rapport has been established.

the words and phrases which dominant people themselves have used when asked to describe their own feelings about themselves.[5]

Low-dominance feeling generally consists of either the absence or opposite of these feelings, as well as of certain positive and unique characteristics. Very often a low-dominance person will describe his feelings about himself in negative fashion. "I lack self-confidence." "I feel inferior with most people." "I guess I don't think much of myself." "I think I'd rather be like someone else if I could." The feelings of persons of this type are of uncertainty, lack of confidence, general inferiority, shame or lack of pride, weakness, general admiration and respect for others rather than for themselves, a feeling of being, in a very metaphorical sense, 'below' others, of being looked down upon, of wanting to be like someone else rather than oneself, of being dominated by others, of lack of faith in oneself and in one's abilities. They often feel shy, inhibited, timid, unworthy, self-conscious and embarrassed. Generally they cannot be said to be satisfied with themselves. This is further illustrated by the presence of inferiority feelings as an important and primary part of the personality picture in low-dominance people (which is only infrequently the case in high-dominance people).[6] Generally, in low-dominance people we do not see the ease, the calm, the natural assurance, the lack of restraint and

[5] It is necessary at this point to insist as strenuously as possible that dominance-feeling be not confused with domineeringness, with antagonism to others, willfulness, impoliteness, selfishness, aggressiveness, tyrannizing, etc. If the reader finds himself prone to think of a high-dominance person as rather a nasty person, one who would push him out of line or punch him in the face, let him substitute 'self-confidence' for 'high-dominance feeling.' and 'lack of confidence' for 'low-dominance feeling.' They are not synonymous, but at least the substitutes bring less misunderstanding in this direction. The writer uses the word 'dominance' because, even after much thought, he has not been able to find one that is not also misunderstood, and at least our phrase makes the animal work continuous with work for children and adult human beings. Another possible substitute is high or low ego-level.

[6] This list of at least partially disparate feelings and attitudes would indicate that dominance-feeling is not a unitary thing, that it is more heterogeneous than homogeneous. It is probably more cautious to proceed on the basis of such an assumption, since unitariness of all these aspects of dominance-feeling has not yet been proved. It is the writer's belief and impression, however, that dominance-feeling is ultimately a simplex, rather than a complex.

'tension,' the lack of fearfulness, that impresses us in high-dominance people.

One question that frequently comes up in the mind of the person not thoroughly acquainted with the various concepts of dominance is the variability with mood. He is apt to think that at one time a person feels very dominant and at another time very subordinate. Of course this opinion is partly due to the confusion between dominance-feeling and status. It is perfectly true that status can vary widely with a situation and that the general mood is, to some extent, a reflection of the status, but it is the writer's impression that, as a usual thing, dominance-feeling fluctuates (because of mood) only within a small range of the total range of dominance. Introspectively, of course, any one person knows only his own range of dominance-feeling and is apt to regard it as a very wide one. With increased knowledge of the total range for the general population, realization of the comparatively minor size of his own individual fluctuation is sure to ensue.

There is no doubt that a long series of successes or failures, shocks, traumata, continual subjection to one kind of status rather than another will all have their effect on general dominance-feeling—that is to say, there may be a slow long-time lowering or raising with long-time success or failure. Feeling, however, is a relatively stable thing. It can change, but it needs major impacts and many of them for this change to occur.

If we were forced to choose a single synonym or definition for dominance-feeling, we should say that it was chiefly the the evaluation of, or confidence in, the personality (self-confidence). High-dominants evaluate their personalities or selves highly; the self of the low-dominant is given a low evaluation by the subject himself.[7] Between the two extremes described, there are all degrees of intermediate strengths of evaluation of, or confidence in, the self, and the whole forms a smooth continuum on a single dimension, in which it is possible to place almost any single person. It is

[7] This means evaluation of the *whole* personality, rather than just one part of it. A person may evaluate his intelligence very highly indeed and still be low in dominance-feeling. See below, page 412.

obvious that, since this dominance-feeling varies in degree, it is susceptible to treatment by the usual statistical and experimental methods that have been used, for instance, with such great success in the consideration of intelligence. Such a phrasing, it seems to the writer, is a far more useful one to the *science* of psychology than the clinical, psychotherapeutic, qualitative treatment accorded it by the psychological physicians (even though we have probably oversimplified).

II. The Relationship Between Dominance-Feeling and Dominance Status

Feeling and status of dominance are at least partially circular in their relationship. Feeling, to a large extent, determines status, and status (to a lesser extent) also determines feeling.

When two people come together in a face-to-face relationship, a conscious or unconscious sizing-up process ensues, that looks much like what we see in infra-human primates (14). This process, of course, is infinitely more subtle than it is in animals. It is much more influenced by the immediate psycho-social situation, and by such cultural elements as clothes, wealth, reputation, social position, etc. Also, in meetings of unlike-sex pairs, the generally inferior position of women in our culture puts her at a further disadvantage.[8]

It is still possible and valid, however, to point out that the main elements at work in this sizing-up process are the levels

[8] It is interesting to compare with these statements the conclusions and speculations of the writer on the establishment of dominance status in pairs of monkeys meeting for the first time. "Our suggestion would be that dominance (status) is determined by, or actually is a composite of social attitudes, attitudes of aggressiveness, confidence or cockiness . . . . A very apparent 'sizing-up' process goes on during the first few moments of meeting, and it is during these moments and during this process that dominance (status) seems to be established" (14, p. 305). In these animals difference in size was very important in this sizing-up process. This is much less true for humans, although still a factor. In retrospect, it is at least possible to read for 'social attitudes, attitudes of aggressiveness, confidence or cockiness,' simply 'dominance-feeling,' with the one amendment that aggresssiveness is not a necessary or even usual component of dominance status in human beings. In humans, as in animals, the first meeting is usually far more important in determining dominance status than any single subsequent meeting.

of dominance-feeling in the two members of the pair. Each has a certain opinion of himself, of his own strength and forcefulness, of his capabilities and shortcomings, of his own place in the generality of people whom he has met and whom he will meet. It is this evaluation of the self that is compared with the evaluation of the self (expressed overtly) before him, and it is from the unconscious perception or realization of the comparative status of the two personalities that the dominance-subordination relationship of the particular social group emerges, in some cases immediately, if the relative status of dominance-feeling is very obvious to both members of the pair, in other cases slowly and with much feeling-out and unconscious 'sparring.' In still other cases, there need be no emergence of a relationship of dominance-subordination; instead we may have a perception of equality, friendship, and mutual respect, with a consequent status of equality for the two members of the pair.[9] To some extent, also, in such pair relationships, it is possible to have 'split dominance status.' That is to say, one of the pair may be by

[9] Dr. Max Wertheimer, in private conversation, has brought up the following very interesting point. Dominance-feeling is to some extent connected with being 'high.' This can mean (1) higher than others, better than they are, or (2) 'high' in the sense of being adequate to the task or problem in hand, without reference to comparison with other men. That is to say, there are those artists, physicians, or scientists who wish only to express themselves as adequately as possible—to help, to serve, to fulfill their obligations to society, and to express themselves to the best of their abilities. What others might do in a similar situation has nothing to do with the self-evaluation. An artist who has painted a portrait may think in either of two ways: "Is this better than the products of my rivals?", or "Does this satisfy me; is it the best I can do; does it express my original conception satisfactorily?" Some artists need the admiration of audiences and the stimulus of rivalry, but some artists do *not*. These evaluate themselves only by an internal and personal scale of values rather than by a social, competitive criterion.

I agree that, even though people of this latter type are rare, they should be considered, since their rarity is not so much a reflection of fundamental emphasis in human nature as it is a product of the dominant trends of rivalry, competition, urge-for-power-over-others which characterize our culture. Presumably, in a coöperative culture such personalities would be the rule rather than the exception.

In this same connection we may mention also Dr. Wertheimer's insistence on other determiners of dominance behavior, for instance, sheer *need* for dominance behavior because of the situation; *e.g.*, a father who sees his child assaulted by a bully may behave in a way that has no reference whatsoever to his dominance-feeling. Another possible source of dominance behavior is being right or correct when others are not. Still another determiner of behavior that might look like dominance is hyper-energy.

far the better of the two in intellectual equipment and capabilities, whereas the other may be recognized as the undoubted superior in social abilities and equipment.

This latter relationship of 'split dominance' is met less frequently than most people think. For one thing, people usually have few voluntary contacts with those who are very different from themselves in any important respects. The person who values intellect very highly is not so apt to come in close and sustained contact with persons who do not value intellect highly. In the second place, the more usual rule is that all the capabilities, strengths and weaknesses of the personality are thrown together into a unit and it is this *unit* that is the basis of comparison with others. The usual person thinks of himself as a whole and not as a melange of separate and discrete superiorities or inferiorities.[10] It is true that the psychologist, from the outside, may diagnose Case L. M. B. to be one of high dominance-feeling, which seems to be built mostly upon an undoubted attractiveness to, and success with, men. L. M. B. herself, however, does not diagnose herself so. To herself, she is simply a superior person in a very general

[10] Dr. E. Duffy and Dr. G. Murphy have pointed out that sheer dominance-feeling or feeling of general inner strength seem to some extent to vary independently of evaluations of some sub-abilities or sub-sections of the personality. In empirical terms, this has meant in our study that we have had subjects who were low or middle in general dominance-feeling at the same time that they were superior and felt superior in (1) intellectual ability, (2) social ability or intelligence (girls who come from 'best families' and who have recognized social status), and (3) mechanical ability. There are probably more, but these are the only ones we have ourselves observed. We have also observed cases in which complete inferiority in any one of these respects was taken calmly and matter-of-factly without any repercussions on general dominance-feeling. For example, one man with high dominance-feeling seemed to be completely untouched by the fact of his inferiority in mechanical abilities, and there was even detectable in him a slightly condescending attitude toward people who were interested in such things. It is the degree of importance assigned to a particular ability by the subject himself that will determine its importance as a builder of dominance-feeling. An intellectual's level of dominance-feeling is pinned far more closely to his superiority or inferiority in intelligence than would be the case, for example, in a professional athlete. It is the writer's experience that social inadequacy is less apt to vary independently of dominance-feeling than either intellectual or mechanical inadequacy. That is to say, it is easy to find cases of people of low dominance-feeling who are confident in their ability to handle teacups, introductions, and matters of etiquette correctly, but cases of people who are high in dominance-feeling and who at the same time lack the superficial social attainments are much more rare, although they can be found.

sense. It is even truer to say that she does not diagnose herself at all; she simply feels superior.

We have already described above the general syndrome of behavior and mutual attitude for the dominance-subordination status relationship. To some extent such syndromes must remain a generalized abstraction or averaging of the realities of behavior, since there are several different ways of expressing dominance, any one of which may be used by an individual (either monkey or man). Some dominants are protectors, others are tyrants, others are 'individualists' in the sense that they do not readily express dominance in behavior so long as others do not try to dominate them.[11] To be more accurate, we should describe at least three syndromes of dominance-subordination status behavior, corresponding to these three kinds of dominant people.

One further amendment must be made to the generalized description of status behavior that we have outlined. If either person in the relationship is at either extreme of the distribution of dominance-feeling, modification of status behavior is likely to result. For one thing, the person high in dominance-feeling is apt to be very restive in subordinate status, especially if the person in dominant status is arrogant, tyrannical, silly, bullying, or if in general he is felt not to be worthy of dominance status. Further it is the writer's impression, although he has too few observations bearing on this point, that persons very low in dominance-feeling may never or rarely behave in a dominant fashion even when in dominance status, especially if the person or persons in subordinate status are felt to be higher in dominance-feeling. (This may be the case, for instance, in some such instance as the housewife, low in dominance-feeling, who is mistress of several servants.)

Aside from these and similar considerations, the dominance-feelings of the members of this pair or group are apt to have

[11] We have observed at least these three qualities of dominance expression in three species of infra-human primates. The dominant macacus rhesus is typically a tyrant and a bully, the chimpanzee a friend and a protector, and the cebus monkey an 'individualist' in the above sense. See (12). See also Bühler (4) for descriptions of three types of social personality in children.

surprisingly little influence on status behavior, after relative status has once been determined. In rhesus monkeys it was found possible to study many separate interpairings of animals and then to treat one animal with dominance status as equivalent to any other animal with dominance status. One could do the same for all (rhesus) monkeys in subordinate status. One dominant animal, by and large, behaves like any other dominant status animal, and a subordinate status animal behaves like any other animal in this same status. And in our experiments this held true *even when we paired and interpaired a small group of six animals.* This same animal A, who was dominant over B and subordinate to C, behaved like any other dominant animal with B, and like any other subordinate animal with C.

It may be assumed that these animals differed in dominance-feeling but, once social status was determined, it was impossible to diagnose the level of dominance-feeling of the individuals concerned except in extreme cases. See, for instance, the behavior of Kathryn (16), a strong dominance animal, who occupied subordinate status in the pairings because of her youth and small size.

In other words, for these rhesus monkeys there seem to be only two kinds of status, dominance and subordination, and within each status we have found relatively little range of individual differences determined by dominance-feeling. (This is much less true for chimpanzees and cebus monkeys.)

In humans we find some likenesses and some differences. Generally we find more similarity between pairs (*e.g.*, married couples) than we might have suspected. We may find in one married couple that the husband is dominant to the wife but that both are very high in individual dominance-feeling. In another couple we may find the same status of wife and husband but find them both *low* in individual dominance-feeling. In these two pairs we shall find much community of behavior. The same seems to be true (although our evidence is limited) where the status is reversed, *i.e.*, the wife is dominant over the husband.

True, the level of dominance-feeling in the individual will determine broad differences (chiefly in attitude toward sexual behavior) from one pair to the other, and we shall find the dominance-feeling of the individuals determining relationship to outside people in the expected way, but the married relationships *qua* relationship in the two married couples are similar in their broad outlines, *e.g.*, one determines, the other concedes, one tends to withdraw before the anger of the other, respect flows more in one direction than in the other, one is more 'powerful' than the other, etc.

As in the monkeys, we find at the extremes of the range of dominance-feeling some determination of differential behavior in subordinate status. A woman with very high dominance-feeling, who is nevertheless in subordinate status to her husband, tends to criticize, to quarrel and to resent her status, and sometimes attempts to change it.

It has been found that this fact of little range of behavior within a status has extensive implications for the methodology of studying dominance in humans. The experimenter who attempts to determine dominance rating by inspection or short interview will inevitably find that he underrates the dominance-feeling of many people who stand in a subordinate status with respect to him, and to overrate many people who stand in a dominant relation to him. This follows naturally from our discussion above. All people in subordinate status to him will look spuriously alike in their general social behavior (with respect to the experimenter); all people who dominate the experimenter will look more similar to each other than they really are. To a giant all dwarfs look equally small and to a dwarf, giants look equally tall.[12]

[12] It follows that the interviewer must be very careful in several respects: (1) He must know where he himself stands in the scale of dominance-feeling; (2) he must not judge the dominance-feeling of a subject merely from the relationship obtaining in the interviewing room; (3) he must judge and rate the subject by the latter's behavior and feeling with respect to the *general* population, and not to one or two people; (4) if ratings of the subject are to be obtained, it is best that these be average ratings by several people who stand in a close relationship to him (as peers, *not* as parents, teachers, employers, etc.); (5) it follows also that, theoretically, the best single ratings in an experiment on the general population can be obtained from a rater who stands at the middle of the scale for dominance-feeling; (6) he must be careful to appreciate completely the influence of his own cultural status, *e.g.*, being a teacher, physician, older person, etc.

III. Dominance Behavior: Compensation

Dominance behavior is almost always social, almost always with respect to another person or persons. If it were possible to observe single isolated human beings in such a way that they were not aware of being observed, it is doubtful whether we could distinguish easily between even the most and the least dominant subjects on the basis of their behavior with respect to inanimate objects alone.

In social situations, however, it is usually possible to make at least a very rough rating of dominance-feeling of the subjects involved on the basis of their behavior alone. As the situation in which observations are made becomes more experimental, *i.e.*, constant psychologically from subject to subject, quantitatively scorable, etc., as for instance, in the experiments of Jack (**10**) and Page (**18**), the rating or score becomes more and more reliable and valid. This rating, if it hopes to measure dominance-feeling rather than mere dominance status, must be a composite of the behavior of the subject with respect to *many*, rather than one or two other subjects. When one attempts to rate the dominance-feeling of a subject on the basis of his behavior with respect to *one* other person, results are sure to be very inexact, for reasons that we have discussed above.

It must be remembered that dominance behavior may not be expressed by a woman as freely as by a man. The very definite training that most women in our culture get in being 'lady-like' (non-dominant) exerts its effect forever afterwards. The dominant woman may differ little or not at all in her dominance behavior from the median dominance woman, at least in the ordinary daily social routine. In any case, she at least knows *how* to be, as one subject phrased it, "innocent and girlish and sweet sixteen," and can put on this appearance at will, especially in dealing with people of the older generation. For instance, it seems, from all that can be gathered from the subjects of this study, that the ordinary college Dean of Women *never* sees any kind of behavior but this.[13]

[13] Inhibition of dominance behavior differs in various parts of the country, and it differs in different ways for the two sexes. For instance, the writer has been told by a

A few kinds of dominance behavior are to some extent independent of status, being instead almost purely functions of level of dominance-feeling. That is to say, a person with high dominance-feeling may show a degree of constancy in certain behaviors regardless of his status at the moment. The same is true for the low-dominance person to a lesser extent. For instance, the high-dominance woman in subordinate status—say, in an office—will not blush or be embarrassed or self-conscious even when she speaks to her boss (although other behavior *will* reflect the influence of her subordinate status, *e.g.*, deference, respectful behavior, etc.). Carriage, mien, demeanor of a certain type seem also to be constant characteristics of high-dominance women, regardless of status. For instance, it seems to the writer, although he has no more specific evidence than impression, that the high-dominance person stands more erectly and has better carriage, has a firm handshake, gazes steadily into the eye of the person to whom he or she is speaking, walks with a freer swing of the body, is less apt to hesitate or stammer in speaking, etc.[14]

There is, however, still another reason why dominance behavior alone is a weak reed to rest on if the desideratum is a rating of dominance-feeling; namely, the fact that some people compensate for a feeling of weakness (low dominance-feeling) by behaving in a very dominant fashion.

Compensation may be diagnosed when the behavior of the subject is rated higher in dominance than his dominance-feeling. Such subjects feel weak but wish to appear strong. In order

psychologist who was born and raised in the South that she was taught never to express dominance behavior openly with respect to men, at least marriageable men. It seemed to be permissible to attempt domination *after* marriage, but even this was to be done subtly by coaxing, wheedling, pleading, etc., rather than by any 'unladylike' and open forcefulness of behavior. As nearly as the writer can determine, open and at times cruel domination of Negroes is permitted for either sex, but even this differs with different classes of the population, and for different 'kinds' of Negroes. Various kinds of dominance behavior are treated differentially in other parts of the country, also. In completely different cultures, we may of course see even more marked discrepancies between dominance-feeling and behavior. For instance, among the Japanese, subordination behavior has become institutionalized as the *only* way to behave politely.

[14] A careful, extensive study of dominance-feeling and expressive movements, now being made by P. Eisenberg, will furnish a check-up on these and other hypotheses about dominance-feeling and behavior (6).

to achieve this end it is necessary for them to put about them a cloak of dominance behavior that, in a sense, is not 'natural' to them. Such people protect or defend themselves psychologically, and with only superficial observation of behavior to rely on, it is very easy to confuse these cases with genuine cases of high dominance-feeling.

If, however, we observe cases of *over*-compensation closely, certain characteristics of behavior may in some instances enable it to be distinguished from dominance behavior that flows from high dominance-feeling. In the first place, it is apt to give the observer the impression of being strained and unnatural. It is more aggressive and louder than seems to be appropriate to the situation. It is, in some cases, apt to be even somewhat vulgar, and may sometimes also give the observer the impression of expressing defiance or a chip-on-the-shoulder attitude, rather than calm assurance. Such people are apt to be more 'flip' than the average, to be hypercritical, to be ' wise-crackers,' to be ultra-sophisticated in a manner that indicates an eager desire to impress others with this quality. In several cases, feelings of conflict and ambivalence toward sex went with very free, even loose, talk about sex. In other instances the compensatory behavior took the form of apparent snobbishness with haughty, cold, aloof behavior. All the above is less true for compensating (rather than *over*-compensating) cases.

The compensating subjects turned out to be located around the middle of the distribution for dominance-feeling, both by interview rating and scores obtained in the author's 'Social Personality Inventory,' a test for dominance-feeling now in process of standardization. Of the relatively few subjects with low dominance-feeling that we have been able to study, there was no case of compensation.[15]

[15] There was no difficulty in getting women in the middle of the distribution and above to submit themselves to fairly embarrassing interviews concerning their private lives. It was practically impossible to get as subjects women at the lower end of the distribution. The few that were obtained were students of science and felt that it was their duty to submit themselves, especially in view of the almost tearful pleadings of the by now distraught experimenter. Low-dominance women find it extremely difficult and distasteful to reveal their psychological 'innards,' even for the sake of science. We do not care to make this a generalization, since of sixty women studied, only four

Very little can as yet be said about the etiology of the tendency to compensate, if we confine outselves to our own results.[16] Of interest, however, is the fact that, of twelve clear cases of compensation, eight were Jewish women, whereas Jewish women were only 20 per cent of the total group studied. The research lead here is obvious. The writer's 'hunch' is that at least one fruitful hypothesis about compensatory dominance behavior might be to consider it, for research purposes, the reaction of a minority cultural group to its feeling of not being quite at home in the larger cultural milieu, of not being completely wanted or respected. This hypothesis is borne out by the fact that behavior with family, with close friends, with the husband, etc., is *not* of the compensatory type. It occurs only when *defense* is felt to be necessary.[17]

Compensatory dominance behavior may be taken as one example of a larger concept; namely, discrepancy in general between feeling and behavior. We have already demonstrated that the correlation between feeling and behavior is not close in many instances. We should also mention the fact that in many instances in our own culture and in other cultures behavior is *less* dominant than feeling. The direction of the discrepancy would, to some extent, seem to be determined by the basic emphases of the culture in question. In aggressive, competitive, or rivalrous groups, high dominance behavior would be more desirable socially; and in such cultures we should expect to find much compensation and over-compensation in one sense. In Japan behavior is usually non-dominant, while feeling, on the other hand, is, so far as we can tell, more or less 'normally' distributed. There is cultural repression of overt dominance behavior in this instance.

were definitely low in dominance, and even in these there were some isolated instances of 'putting on a front' for psychological self-defense.

[16] We owe the invention of the concept of compensation to Alfred Adler (2), and his works should be consulted for extensive discussions of the role of compensation in the personality. We have deliberately restricted ourselves here to drawing conclusions *only* from our own data.

[17] One subject, a case of compensatory dominance behavior, said of a certain man who was conversing with her, "He was so dominant, I relaxed completely." Another girl, obviously compensatory, said she could not relax except in the company of very close friends or someone who was very dominant. In the company of one man, who dominated her completely, she always relaxed completely.

In the case of the early Christians the stress again was on lack of dominance behavior with respect to one's fellows. It is true that there was just as much stress on lack of dominance-feeling, and that the whole trend of thought was in the direction of humility and meekness, but it is easy to see that the cultural stress would have been far more efficient in stamping out dominance behavior than in stamping out dominance-feeling.

Dr. Wertheimer has suggested [18] the term 'psychological lying' for such discrepancy between feeling and behavior—since dominance behavior may give a completely false index to the immediate inner state that motivates it or is associated with it.

IV. Matter-of-fact Superiority and Inferiority

Dodge and Kahn (5) have made the distinction between *feelings* of inferiority or superiority on the one hand and matter-of-fact superiority or inferiority on the other. In our work this distinction has turned out to be a very fruitful one, being extremely important particularly in the consideration of the self-evaluation of the non-dominant woman. Our finding is that matter-of-fact superiority and inferiority are clearly and fairly objectively recognized and understood by the more dominant woman. In her, however, we do not find many *feelings* of inferiority (in a psychopathological sense). There may be feelings of superiority but they again are not in any sense psychopathological. They are rather calm, objective recognition of facts that exist.

In the non-dominant woman on the other hand, we find a very different state of affairs. Far greater stress is laid in the psychic life upon matter-of-fact inferiority, little stress upon matter-of-fact superiority, much as we should think that the opposite would be the case. Further, it has been found that regardless of matter-of-fact superiority or inferiority, a predominant role in the personality picture of non-dominance women is played by feelings of inferiority. These feelings in many cases have no bases in fact. That is to say, the outside

[18] In conversation.

world may recognize such a woman to be very intelligent, but she is very apt to have feelings of inferiority about her intelligence in spite of this. Where the opinion of the outside world about matter-of-fact superiority has finally been impressed upon and accepted by the non-dominant subject (as in the case of one woman who was outstandingly lovely), in no cases has the writer found that such recognition gives rise to feelings of superiority. Rather such recognition of matter-of-fact superiority is pushed into the background and is not used as one might expect in the building up of self-evaluation. It seems unimportant and has little influence in the personality picture of such women, whereas, on the other hand, the slightest matter-of-fact inferiority is selected out, magnified and concentrated upon. A dozen assurances of, for example, high intelligence, are outweighed by one statement or hint of the contrary. This seems much more important in the total personality than one would ever expect.

In summary, then, we may say in a very general fashion, that dominant women have few 'feelings' of inferiority, but that non-dominant women do have many such feelings of inferiority and in both cases the presence or absence of these feelings is not plainly determined by matter-of-fact inferiorities or superiorities.

V. The Craving for Dominance

It is very easy to confuse the craving or desire for dominance with the other concepts that have been presented above. They should be clearly distinguished. It is not, for instance, the same as dominance-feeling. Out tentative finding about the relationship between the two is that some people high in dominance-feeling do have the craving for dominance status, and others do not. This seems to go with the degree of presence of the independent variable of activity or aggressiveness. The dominant person who is high in aggressiveness or activity (in the Adlerian sense) is the extremely ambitious person who craves recognition of superiority by others or, in other words, dominance status (face-to-face). The dominant person who is not active in this sense, is quite content to feel

superior without attempting to force recognition of this superiority upon others. In other words, he is quite content to feel superior whether or not others recognize this superiority.

Obviously the cases we have described as compensatory may be said to have great craving for dominance status. They also have a desire to *feel* dominant. "I wish I could be calm and self-assured." No person high in dominance-feeling ever makes such a statement.

It is difficult to discuss the place of craving for dominance in the low dominance-feeling case, because of the small number of subjects. It is the writer's impression that there is a certain distrust of their own ability to maintain and be successful in dominance status. They do not wish to be bosses or executives or leaders simply because they think they would not be successful in such roles. But it is definitely true for the cases studied that they *do* crave higher dominance-feeling. They wish to be other than they are, in that they hate their feeling of inadequacy, of weakness and lack of forcefulness. They would wish not to be shy, bashful and timid. Their self-consciousness tortures them and they would like to be rid of it.

Another way of looking at the craving for dominance is to attempt to understand its place in our culture. If we consider the total range of dominance-feeling and of dominance behavior, it is obvious that in our society the upper ends of these distributions are the more socially approved ones. What we interpret as the craving for dominance may then be a direct expression of the fact that most of us are creatures of our culture and desire what it desires. If the cultural stress is upon high dominance-feeling and high dominance behavior, then these are what we wish or crave.

Finally, it is possible that the most parsimonious way of treating this concept is to think of it in specific, rather than general, terms. It may be possible and even desirable to speak *not* of craving for dominance, but of craving for health *per se*, or of an automobile (not for what it symbolizes psychologically, but simply for its own sake). Or one may crave to be free of timidity, not because of an attempt to increase self-

evaluation, but simply for vocational efficiency; *e.g.*, in order to be a better teacher or a more efficient physician.

VI. The Role of Dominance in the Total Personality

In our dealings with subjects as total personalities, we found, as an observational fact, that some high-dominance people were active and aggressive, and that others, equally high in dominance-feeling, were calm, quiet, and non-aggressive; some were sociable and some were not; some were highly sexed (in a sheerly physiological sense) and some were not. Of these four traits of dominance, activity, sociability, and sexual drive, any combination seemed to be possible. For instance, a single individual might be high in all traits, or high in any one and low in the others, or high in two and low in two, and so on.

No claim is made that these four traits analyze the personality definitively into a perfect and inclusive system.[19] There are many aspects of personality that were not considered because of the techniques used or because of the limitation of the research purpose. Nor is it necessarily true that these are fundamental and homogeneous. It may be that they are cross-cut, superficial, resultant products of other personality traits. These conclusions are presented merely as a set of variables that are independent from the point of view of a researcher interested in knowing how much can be predicted from a knowledge of dominance and in the hope that they may be suggestive. It is our experience that at least two general kinds of behavior that *cannot* be so predicted (within our framework of definition and method) are activity and sociability (also sexual drive). If it be conceded that one task of the experimentally oriented psychologist is to analyze the personality into the fewest possible number of mutually exclusive traits, whose measure would give us the optimum picture of the personality attainable by quantitative methods,

[19] Or better, *three* traits, since sheer physiological sexual drive has surprisingly little influence on personality, or for that matter, even on sexual behavior. The proofs for this statement will be presented in a forthcoming paper. Another possible dimension of personality is "ego-security."

then the particular system of proposed independent variables of personality presented here is a start in the right direction.

All three qualities taken together give a very nicely rounded and fairly complete picture of a particular individual. Knowing the subject's rating for them, we should be able to predict a good deal of his social behavior, of his relationships to specific kinds of people, of his interests, likes and dislikes, vocational aptitudes, etc.

It is interesting to note that factor analysis studies to some extent support the primary importance of the qualities we have mentioned (excluding sexuality which is not and cannot now be studied scientifically because of cultural restrictions). Flanagan's (7) well-known factor analysis of the four Bernreuter personality scales led him to the conclusion that these four (neuroticism, introversion-extroversion, self-sufficiency and dominance) were cross-cuts of two main variables which he named *self-confidence* and *sociability*. Flanagan's self-confidence comes close to our conception of dominance-feeling, and for the moment we may assume it to be an equivalent.

Williams (19) also made a factor analysis of some data on social behavior of children. Thirty traits were observed and rated separately. Analysis showed that two factors accounted for almost all these traits of behavior, ascendance-submission and what Williams calls approach-withdrawal. Examination of his data leads us to believe that this latter 'factor' is a combination of our two factors of sociability and activity.

A study by Dr. H. C. McCloy (17) of mutual character ratings by a group of intimately associated college men has given approximately similar results. The first two factors in McCloy's analysis are strikingly similar to Williams' two factors. The factor which he calls 'social qualities' again seems to be a complex of what we are here calling activity and sociability.

A recent study by Guilford and Guilford (9) again gives similar results. Factor analysis of the results from a test of introversion-extroversion brings to light five factors of which one seems to be comparable to dominance in one restricted sense, and another one to sociability.

While the validity and usefulness of the factor-analysis technique are still being discussed and being called into question, such similarity in four different studies using various kinds of material is surely suggestive.

It is as yet too early to say which of the various maps of the personality offered to us is best and most useful. We wish only to stress here that an empirical approach to this problem is possible. In the actual contact with many personalities we can find out, at least in a preliminary fashion, (1) which are the most important fundamental aspects of personality, (2) what is the most parsimonious way of analyzing the total personality into conveniently handled aspects, (3) which of these aspects of personality are related to each other and which are independently variable, and (4) what behavior is connected with each of these aspects.

The Relationship of Behavior to Inner State.—We have already demonstrated, in the field of sexual expression, that a single kind of behavior may be a product of (or may be correlated with) different inner states in animals. In monkeys, sexual behavior may be an expression of impulse to dominate, or it may be a direct product of physiological sexual tensions. There are also indications that the same thing is partially true for humans also.

We wish now to call attention to the fact that a single inner state may give rise to various different forms of behavior. This, of course, is nothing new, for Freud has long since pointed out (**8**) that a state of conflict and repression may result in expression through any one of the so-called 'Freudian mechanisms,' *e.g.*, sublimation, hysterical symptoms, rationalization, etc. We have pointed out above a few of the various possible relationships between dominance behavior and dominance-feeling and have, we think, demonstrated the lack of invariable relationship between them.

A start has been made in the analysis of seemingly similar behaviors that are, however, correlated with different inner states. For monkeys, see (**15**). We have attempted in this paper to indicate how compensatory dominance behavior and 'true' dominance behavior may be distinguished. In the

early stages of his work, the experimenter was unable to see any differences at all between them, just as at first he could see no overt differences between dominance-sexual behavior and hormone-sexual behavior in monkeys. Close observation and analysis gave at least partial success in both instances. It may be that the same will be the case in other similar problems.

VII. Culture, Personality and Dominance [20]

We wish to emphasize that the picture we have presented is drawn for *our culture alone*. And even then there are many indications that there exist many broad sectional-cultural differences of real significance within the United States alone. What is more, there are within the two places where most of this research was prosecuted (Madison, Wisconsin, and New York City) significant class, race, religious, educational and socio-economic differences in determination of dominance-feeling and behavior.

It may be that there will be found in the future, innate bases of one sort or another for individual differences in dominance-feeling within a particular cultural frame of reference. On *a priori* grounds, there would seem to be good reason to believe that differences in hormone balance which are independent of culture should have something to do with predisposing one individual to greater or lesser aggressiveness, for instance. At the moment, however, we cannot emphasize too strongly that, while such biochemical determiners have not yet been demonstrated conclusively, we are even now sure of some cultural determination of dominance-feeling, behavior and status.

The writer has made a study of some of the ethnological literature in the hope of finding broad common-human characteristics in connection with dominance. Little that is certain was carried away from this study beyond the fact that in most of the cultures which were studied, there seemed to be discernible relationships (of a kind) of dominance-subordination as be-

[20] I wish to thank Dr. Ruth Benedict for suggestions given in dealing with this subject.

tween individuals. That is to say, there seem to be found in most cultural groups some individuals who are considered to be 'inferior' persons, and these judgments of relative value of personalities seem to be as important in determining dominance status as they are in our culture. *But*, and this should be kept firmly in mind, the bases for a person considering himself 'superior' in cultures A, B, C and D may be widely different, and also the strength, ubiquity and nature of such relationships differ very widely from culture to culture.[21]

In some cultures, it seemed to the writer that (at least on the basis of the psychologically inadequate data usually presented by the social anthropologist) no distinction could be made between 'face-to-face' and 'cultural' dominance-subordination status. Or perhaps it might be better to say that in some cultures no evidence is given for the existence of the former. In very rigidly stratified and structural groups (caste system of India) most status relationships follow reflexly and without any lability from cultural status determined before the birth of either individual in any pair.

In other cultures with little structuring (*e.g.*, Eskimo), relationships of dominance-subordination are more often determined by such animal qualities as strength, size, agility, cunning, etc. See also Linton (11) on 'status personality.'

With few exceptions the behaviors characteristic of dominance-subordination feeling or status are local, cultural accidents. It follows, therefore, that the problem of understanding why particular behavioral ways of expressing dominance-feeling came to be *connected* with this feeling, is not so much a psychological as a cultural-historical study.

It is interesting to note the indications of a few universal (so far as we can tell) ways of expressing dominance and subordination in behavior. For instance, so far as our study has taken us, we have found no group any place in the world where kneeling, bowing or prostrating oneself before another person is an expression of dominance. These and similar forms of behavior express *only* subordination in all those cases

[21] Among such cultures as the Zuñi, we find many forms that can be interpreted only as a stamping-out by the group of the impulse to dominate (3).

in which they have any social-personal meaning at all. It may be the fact that the writer has found this same tendency in monkeys (for the dominant animal to be physically above the subordinate animal) that causes him to suspect a deeper significance in this trend than would appear on the surface.

Another instance of similarity between the infra-human and the human primate is the expression of dominance by sexual aggression. Wherever we find rape or forced marriage to exist in a recognizable form in primitives or in the history of civilized nations we find that it is the females of the conquered peoples who are its object. And it is just this act that is the last bitter sign of complete submission and humiliation for the men of the conquered people. On purely *a priori* grounds there seems to be no reason why the case should not have been quite otherwise, *i.e.*, that the women of the conquering peoples should not have forced the conquered men to sexual connection or marriage. But this seems never to have been the case (except for certain kinds of individuals in special circumstances which will be discussed in another paper).

Other possible instances of such universal dominance behavior are the infliction of death, and the expression of superior strength (we know of no instance of strength-competition in which to be the weaker one is to be the more dominant). We are not aware, furthermore, of any group in which inferior height is regarded as a dominant characteristic over greater height (within 'normal' limits). Again in no case (in the few cultures for which this behavior is described) is a less sexually potent man regarded as dominant over the more potent and virile man. Quite as interesting as this is the fact that this is *not* true for women.

However, these few instances of possible universality of dominance behavior (throughout the Primate order) are far outnumbered by the multitudes of local, cultural, dominance behaviors.

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THE DIFFERENTIAL RESPONSE IN ANIMALS TO STIMULI VARYING WITHIN A SINGLE DIMENSION[1]

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I

The differential response of animals to stimuli involving differences of degree, such as intensity, size and wave length, has long been regarded as being based on the relational character of the stimulus situation. Prior even to the emphasis given this interpretation by the new gestalt movement, early American investigators of the problem (**2**, **4**, **5**, **9**) had concluded that animals learn to respond to the relative properties of the stimulus situation rather than to the specific properties of one or other of the stimulus objects. They inferred from these experiments that the animals possessed the ability to perceive the relationship, larger, brighter, etc., and to act in accordance with this ability in new situations in which the same relationship entered. Later, the experiments of Köhler with hen, chimpanzee and human child (**12**) led to a similar emphasis of the relational aspect. The response of the animal in such instances, he insisted, is not to an isolated 'sensation-process' but to a 'structure-process.' It is responding to properties whose character is a function of the situation as a whole and not to any specific or absolute property of a part or aspect of it.[2] Both his experiments and the theoretical inter-

[1] This paper was presented in a preliminary form before the American Psychological Association, in Hanover, New Hampshire, September 1936.

[2] There is, however, a considerable difference between the views of American investigators and the German gestalters which, unfortunately, has not always been clearly understood by some recent writers on this problem. In a certain sense, indeed, their views may be said to be quite opposed to each other. Thus the American group (and this seems to include the current American configurationists) has held to the notion that the response, in such experiments, represents a fairly high order of mental activity, one involving a relational judgment or a definite experiencing of the relationship in the form of some abstract principle expressible as 'food-in-the-larger,' 'always-

pretation he placed upon them have received considerable attention and have greatly influenced thinking on the problem (**12, 13**).

But while the relational viewpoint in one form or another has dominated the attempts at an interpretation of these phenomena, the experimental studies on the problem, almost without exception, have shown that response to relationship is by no means universal. In the transposition tests, in which stimuli of different absolute value but having the same objective relation to one another are employed, the animals sometimes respond in accordance with the relationship, but in a large number of instances they fail to do so. These negative results have led certain psychologists who are opposed to the gestalt viewpoint to be critical of relational interpretations and to deny that the behavior in such experiments necessarily involves either 'transposition of structure properties' or 'abstract relative judgments' (**7, 18, 19, 20**). Beyond pointing out, however, that absolute factors, under certain conditions at least, play an important part, they have had little of a positive nature to offer in the way of an explanation.

II

In a recent article in this journal (**16**) a theoretical schema based on stimulus-response principles and concepts was proposed to explain the nature of discrimination learning in animals. According to this hypothesis, discrimination learning is conceived as a cumulative process of building up the strength of the excitatory tendency of the positive stimulus cue (*i.e.*, the tendency of this stimulus to evoke the response of approaching it) by means of the successive reinforcements of the response to it, as compared with the excitatory strength of the negative stimulus, responses to which receive no reinforcements. Theoretically, this process continues until the

in-the-brighter,' etc. According to the German gestalt psychologists (**11, 12, 13**), on the other hand, response to such relations is a very elementary and natural form of reaction rather than an achievement of intelligence. Its occurrence in animals, particularly the more primitive forms, is conclusive evidence of what is to them the fundamental fact that the stimulus situation is from the beginning organized as a 'whole' and that response is based on 'whole' properties of the stimulus.

difference between the excitatory strengths of the two cue stimuli is sufficiently large to offset always any differences in strength that may exist between other aspects of the stimulus situation which happen to be allied in their action with one or other of the cue stimuli. That is to say, the difference between the excitatory strengths of the cue stimuli, positive and negative, must reach a certain minimum or threshold amount before the animal will respond consistently to the positive stimulus.[3]

The theory as presented in that article was concerned with the discrimination of stimulus objects which differed, objectively at least, in the single characteristic of form; for example, triangle, circle, or square. It was implicitly assumed that there was no transfer of the excitatory tendency acquired by the positive form-character to the negative form-character, and likewise, that the negative or inhibitory tendency of the latter was not transferred to the former.[4]

In the case of such continuous dimensions as size and brightness, however, it would seem reasonable to assume that there is some transfer of training, at least between nearby members of a series. There is, in fact, direct experimental evidence in support of such a belief. Thus Pavlov reports that when an animal is conditioned to a stimulus, *e.g.*, a tone of a certain wave length, tones of different wave length also

[3] This is, of course, only a skeletal and purely conceptual outline of the processes that lead to the establishment of the discrimination habit. It is not intended to be, and in no sense should be construed as, a descriptive account of the behavior of the animal in the discrimination situation. Moreover, the animal learns many other responses in addition to the final, selective approaching reaction. Prominent and important among these are what have been termed, for want of a better name, 'preparatory' responses. These latter consist of the responses which lead to the reception of the appropriate aspects of the total environmental complex on the animal's sensorium, *e.g.*, the orientation and fixation of head and eyes towards the critical stimuli. That is, the animal learns to 'look at' one aspect of the situation rather than another because of the fact that this response has always been followed within a short temporal interval by the final goal response. Responses providing other sensory receptions are not similarly reinforced in a systematic fashion and hence tend to disappear.

[4] In the discrimination of stimulus objects differing only in size, the stimulus aspects which the objects have in common, such as brightness, wave length, etc., receive both reinforcement and non-reinforcement. Their effective excitatory strengths do not, then, change greatly, unless considerable overtraining is given. This problem will be discussed briefly in a later portion of the paper.

acquire the capacity to evoke the response. His experiments suggest further that the more unlike the tone is in wave length from the one employed in the original training, the less will be the transfer or irradiation of the conditioning (14). Bass and Hull (1) have also demonstrated such a spread or generalization of conditioned excitatory and inhibitory tendencies in human subjects.

The essential characteristics of our hypothesis, as they pertain to the type of discrimination problem involving a stimulus dimension of a continuous nature, can be presented most briefly and clearly in the diagram of Fig. 1. (1) We shall

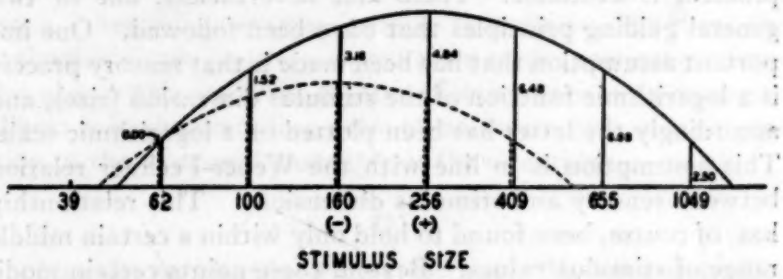

FIG. 1. Diagrammatic representation of relations between the hypothetical generalization curves, positive and negative, after training on the stimulus combination 256 (+) and 160 (−).

assume that, as a result of training or successive reinforcements, the positive stimulus, 256,[5] of the combination 256+ and 160−, acquires an excitatory tendency to the response of approaching it of the amount or strength represented by the solid line at that point. (2) We shall assume that there is a generalization of this acquired excitatory tendency to stimulus objects of similar size and that this generalization follows a gradient such as that represented by the upper curved line. (3) We shall postulate also that with failure of reinforcement of response to stimulus 160, experimental extinction will take place and a negative or inhibitory tendency will be developed to the amount indicated by the broken line at the point on the

[5] We shall describe the stimulus-object simply by a number which represents its area in square centimeters, ignoring other stimulus characteristics which are the same for all stimuli.

abscissae marked 160. (4) Similarly it will be assumed that there is a generalization of this inhibitory tendency according to the gradient shown by the lower curved line. (5) And, lastly, we shall assume that the effective excitatory strength of a stimulus is the algebraic summation of these two positive (excitatory) and negative (inhibitory) tendencies. This value is indicated graphically by the distance between the upper and lower generalization curves and numerically by the number to the right of each line.

The selection of the curves of generalization has been more or less arbitrary as little experimental evidence bearing on the problem is available. There are, nevertheless, one or two general guiding principles that have been followed. One important assumption that has been made is that sensory process is a logarithmic function of the stimulus dimension (size), and accordingly the latter has been plotted on a logarithmic scale. This assumption is in line with the Weber-Fechner relation between sensory and stimulus dimensions. This relationship has, of course, been found to hold only within a certain middle range of stimulus values. Beyond these points certain modifications would have to be made in this relationship. Finally, because elaborate mathematical treatment does not seem to be warranted at the present stage of development, our presentation is essentially graphical. The particular curves have been constructed, however, from mathematical equations relating stimulus values and positive and negative tendencies.[6]

Examination of Fig. 1 reveals the fact that the hypothetical, effective strengths of the various stimuli after the original training on the stimulus pair 256+ and 160− are such that in the transposition test combinations, 409 and 256, and 160 and 100, the effective excitatory strength of the larger stimulus is in each case the greater. Thus the effective strength of 409 is 6.48, as compared with 4.84 for stimulus 256, and the strength of stimulus 160 is 3.16, while that of 100

[6] The curves of generalization of the positive excitatory tendency all have the equation E (excitatory tendency) $= 10 - 20D^2$ in which D is the distance in logarithmic units between the test stimulus and the training stimulus, *i.e.*, $D = (\log S_1 - \log S_T)$. The curves of generalization of the negative or inhibitory tendency have the equation I (inhibition) $= 6 - 20D^2$ in Figs. 1 and 2, $I = 6 - 10D^2$ in Fig. 3.

is only 1.52. The implication of the hypothesis is, that the animal should respond consistently [7] to the larger stimulus in each of these transposition tests. Similarly, as shown in Fig. 2, subjects trained positively to the smaller stimulus, 160, and negatively to the larger, 256, should respond in each of the test combinations, 100 and 160 and 256 and 409, to the smaller stimulus.

We have shown, then, that it is possible to deduce from stimulus-response concepts and principles that animals will respond to stimulus differences of degree in a manner which has hitherto been interpreted as involving a perception of a relationship or response to a structure-process (larger, brighter, etc.). According to the present hypothesis, however, the animal is responding in each situation to the particular stimulus object which has the greater effective excitatory strength. There is in the preceding account no assumption of a perception of the relational character of the situation.

III

Now let us consider Fig. 1 further. We have seen that after training in the combination 256+ and 160− the animal's response in the transposition tests with 409 and 256 should be to the *larger*, 409. In the next combination, however, 655 and 409, the difference (.20) is only slightly in favor of the larger stimulus, and the response should be chance. But, in the still larger combination, 1049 and 655, the effective strengths are such that the response would be expected to favor 655, the *smaller* of the two stimuli. The same result, response to smaller, would be expected for the 1678 and 1049 combination.

[7] Whether the response will be consistently, that is 100 per cent, to the larger of the test stimuli will depend on the size of the difference between their effective strengths. This minimum or threshold requirement for a consistent response is a somewhat difficult matter to handle theoretically. One possible indication of it, however, is the amount of the difference between the strengths of the training stimuli, which, in the present instances, is 1.68. Presumably the threshold value would be somewhat less than this difference as training is usually continued, depending upon the criterion of learning adopted, beyond the point at which the animal is just able to respond with 100 per cent consistency. In the present example we shall arbitrarily assume this threshold value at 1.50. A difference less than this would lead, depending on the amount, to the choice of the stronger stimulus somewhere between 50 and 100 per cent of the trials.

It is apparent then that the results for the transposition tests depend upon the particular stimulus combination employed. The response may be to the larger in some tests, in some to the smaller, and, in some combinations to the larger and smaller equally often—that is, a chance response.

In view of the fact that the point (stimulus pair) at which these changes occur depends upon the extent of the individual generalization curves, it is not possible to make any specific deductions concerning them. The somewhat general implication may be drawn, however, that the amount of transfer will be a function of the absolute change in the test stimuli, the transfer decreasing as the test stimuli are made more different from the training pair. A survey of the experimental literature on discrimination behavior reveals evidence which supports this deduction. Klüver (10) reports an investigation of size discrimination in two Java monkeys which were trained to choose the larger of two rectangles 300 and 150 sq. cms. In critical tests each subject was presented with the following four stimulus combinations: 1536 *vs.* 768, 600 *vs.* 300, 150 *vs.* 75 and 8.64 *vs.* 4.32, and in agreement with the general deduction from our hypothesis we find that the percentage of test responses consonant with the training response, that is, to the larger stimulus, were much less in the extreme pairs than in the combinations nearer to the training pair. In the former, both animals responded approximately only 50 per cent of the time to the larger stimulus, whereas their responses to the larger in the 600 *vs.* 300 and the 150 *vs.* 75 combinations averaged 72 and 97 per cent respectively.

Gulliksen's experiment with white rats (6) also presents data relative to this aspect of our problem. After training them on circular stimuli 9 and 6 centimeters in diameter, he found that the more similar the test combination to the training pair the higher was the percentage of responses consistent with the original training. His results for the various test combinations were as follows: 7½ *vs.* 5 = 97 per cent; 12 *vs.* 9 = 74 per cent; 6 *vs.* 4 = 67 per cent; 18 *vs.* 12 = 53 per cent.

In a series of experiments with chimpanzees designed to test various aspects of the theory, the writer also has obtained

data bearing on this particular problem. Before presenting these results, however, a brief description of the experimental procedures is given. The discrimination apparatus has been described in detail elsewhere (17). Briefly, it consisted of two small stimulus (food) boxes which were presented to the animal by pushing the platform on which they were placed up to a position one inch from the cage wall, so that the animal could reach its fingers through the two-inch wire mesh, push open the boxes and obtain the food. The stimulus forms, squares cut from no. 28 galvanized iron and enameled a glossy white, were fitted with a clamp by means of which they could be fastened to the front of the boxes.

In the training series both positive and negative boxes were loaded with food, but the negative one was locked. When the subject responded correctly by opening the box which carried the positive stimulus, it obtained a small piece of banana as a reward. In the case of an incorrect response, the box was found locked and the apparatus was immediately withdrawn so that there was no opportunity to correct the error. Twenty trials, spaced from 20 to 30 seconds apart, were given in each experimental session. Training was continued on a problem until the subject satisfied a criterion of 90 per cent correct in twenty trials, the last ten of which were all correct.

In that part of the experiment concerned with the particular problem with which we are at present concerned, five adult subjects were used. Three of these individuals were trained originally to respond to the larger of two white squares, 160 and 100, while the other two were trained to respond positively to the smaller square of the combination 256 and 409. Beginning on the day after the learning of these discriminations a series of transposition tests (10 trials each) was given daily, followed by 10 trials on the training combination. The subjects trained positively to the larger were given tests on still larger stimuli, and those trained positively to smaller were tested on smaller combinations. All responses in the test series were rewarded.

Table 1 shows the results for these tests in terms of the percentage of responses consonant with the original training. The upper half of the table presents the results for the three individuals trained originally to the larger stimulus. It will be observed that the average percentage of test responses consistent with the training response decreases from 88.3 per cent to 78.3 per cent as the test combinations are increased in absolute size. The small drop from the second to the third

TABLE 1

SHOWING THE PERCENTAGE OF RESPONSES CONSISTENT WITH THE ORIGINAL TRAINING, *i.e.*, TO THE LARGER (OR SMALLER) STIMULUS OF THE COMBINATION

Training Stimuli	Test Stimuli		
160 (+) vs. 100 (−)	256 vs. 160	320 vs. 200	409 vs. 256
Pati	100% (2) 100% (3)	80% (1) 100% (4)	80% (5) 60% (6)
Mona	50% (1) 100% (4)	40% (2) 70% (3)	80% (5) 60% (6)
Pan	80% (1) 100% (4)	90% (2) 100% (3)	90% (5) 100% (6)
	Mean = 88.3%	Mean = 80%	Mean = 78.3%
256 (+) vs. 409 (−)	160 vs. 256	100 vs. 160	
Soda	50% (1) 70% (4)	40% (2) 50% (3)	
Bentia	40% (2) 60% (3)	30% (1) 40% (4)	
	Mean = 55%	Mean = 40%	

test combination (80.0 per cent to 78.3 per cent) is to be accounted for, in part at least, by the fact that the third test was not given in counterbalanced order, but only after the two series with each of the other two test situations had been given. The order in which each test was given is indicated by the bracketed numbers in the table. If the percentage values in terms of the order of the tests are computed, we find that they increase with each successive test as follows: first—70 per cent, second—76 per cent, third—90 per cent and fourth—

100 per cent. The drop to an average of 78 per cent in the fifth and sixth tests is thus seen to be of considerable significance. A more desirable procedure, of course, would be to use only one test for each subject and have a large number of subjects. The present experiment should be regarded as exploratory and not as offering conclusive results.

The results for the two individuals trained to respond to the smaller of the training pair, 256 and 409, similarly show a decreasing percentage of responses as the smaller test combinations are used. However, a markedly different result was obtained with these subjects, in that the amount of transfer dropped off much more quickly. In fact, in the second test combination, 100 and 160, a slight preference was shown for the larger stimulus over the smaller. That the result for these two subjects was not merely accidental is shown by the results of a further experiment reported below.

Six subjects were used in this part of the investigation; three of which were trained to the smaller stimulus and three to the larger. On the day after the learning of the discrimination a test series of 10 trials was given, in which half of the subjects were tested with the larger of the training stimuli and a still larger stimulus, and half, on the smaller of the training pair and a still smaller one. The next day a second series of test trials was given in which the test stimuli were reversed, *i.e.*, subjects which had had the large stimulus combination were given the small stimuli, and *vice versa*. A retraining series of 10 trials followed each test.

The results for this experiment are shown in Tables 2 and 3. It will be seen that the three subjects trained to choose the larger stimulus (Table 2) responded to the larger stimulus in both test series almost 100 per cent of the time (mean, 93.3 per cent). The data (Table 3) for the subjects trained originally to the smaller stimulus show a different result. While these individuals responded fairly consistently (86.6 per cent) with their original training in the test series involving the negative stimulus of the training pair (256), and a still larger one (512 or 409) such was not the case in the test series involving the positive stimulus (128 or 160) and a still smaller

one (64 or 100). Thus, as will be seen from the last column of table 3, only 16 out of 30, or 53.3 per cent, of the responses were to the smaller stimulus in this test, none of the subjects responding significantly more than a chance number of trials to the smaller stimulus. A second test series of 10 trials with this combination showed a similar result.

TABLE 2

SHOWING THE PERCENTAGE OF RESPONSES IN THE TEST TRIALS CONSISTENT WITH THE ORIGINAL TRAINING, *i.e.*, TO THE LARGER STIMULUS OF THE TEST PAIR

Training Stimuli	Test Combinations	
256 (+) *vs.* 128 (−)	512 and 256	128 and 64
Cuba	90%	100%
Lia	100%	100%
256 (+) *vs.* 160 (−)	409 and 256	160 and 100
Mimi	90%	80%
	Mean = 93.3%	Mean = 93.3%

TABLE 3

SHOWING THE PERCENTAGE OF RESPONSES IN THE TEST TRIALS CONSISTENT WITH THE ORIGINAL TRAINING, *i.e.*, TO THE SMALLER STIMULUS OF THE TEST PAIR

Training Stimuli	Test Stimuli	
128 (+) *vs.* 256 (−)	256 and 512	64 and 128
Jack	80%	50%
Nira	100%	60%
160 (+) *vs.* 256 (−)	256 and 409	100 and 160
Bokar	80%	50%
	Mean = 86.6%	Mean = 53.3%

This failure of transposition to the smaller of two stimuli in the direction of smaller sized stimuli is contrary to the implications not only of the relational theories, but also, of course, to the present hypothesis, *at least in so far as the particular curves of Figs. 1 and 2 are concerned.* Either some modification of these curves is required, or some additional factor must be postulated to account for this phenomenon. One possibility of the latter type is that the larger stimuli have, initially, a greater excitatory value than the smaller ones, or that the

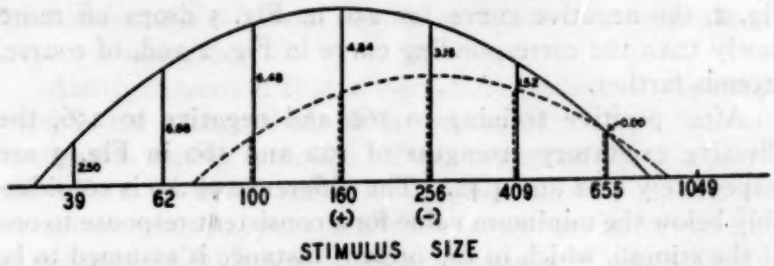

FIG. 2. Diagrammatic representation of relations between the hypothetical generalization curves, positive and negative, after training on the stimulus combination 160 (+) and 256 (−).

larger the stimulus the more rapidly do excitatory and inhibitory tendencies develop with training. Tending to support some such belief is the fact that there was a very slight, although not significant, initial preference shown by the subjects for the larger stimuli. Also the individuals trained to the larger stimulus required fewer trials to learn the discrimination than those trained to the smaller, but again the difference was only slight and not statistically significant. Further experimentation involving relatively slighter changes in the size of the test stimuli is required in order to obtain more adequate data on this problem.

In Fig. 3 is presented a modification of our irradiation curves which fits the experimental data very satisfactorily. The assumption has been made in this figure that the extent of the generalization varies with the size of the stimulus, being greater for large than for small stimuli. Thus, while the positive curve of 160 in Fig. 3 is the same as that for 160 in

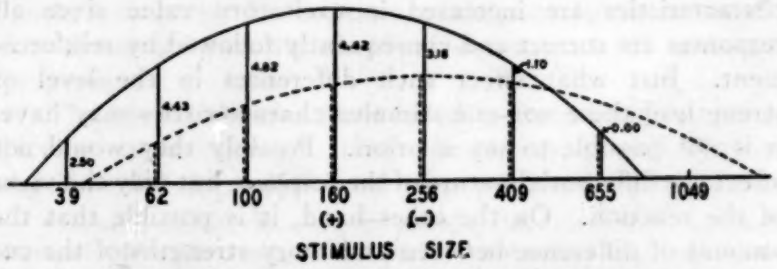

FIG. 3. Diagrammatic representation of relations between the hypothetical generalization curves, positive and negative, after training on the stimulus combination 160 (+) and 256 (−). This diagram differs from Fig. 2 in that the negative generalization curve has a more gradual slope and extends farther.

Fig. 2, the negative curve for 256 in Fig. 3 drops off more slowly than the corresponding curve in Fig. 2 and, of course, extends farther.

After positive training to 160 and negative to 256, the effective excitatory strengths of 100 and 160 in Fig. 3 are respectively 4.82 and 4.42. The difference of .40 is considerably below the minimum value for a consistent response to one of the stimuli, which in the present instance is assumed to be 1.00, an amount which is slightly less than the difference (1.26) between the training pair, 100 and 160. With such a small difference the response to the smaller test stimulus might be expected to be only a chance one, or possibly slightly more. Such a result, it should be noticed, is more closely in line with the data obtained in the present experiments (see Tables 1 and 3).

IV

In concluding this paper there are several further points of a theoretical nature that require at least passing mention. A problem of no little importance is the part played by stimulus characteristics other than the cue difference. Stimulus objects have various other aspects, such as form, intensity, wave length, in addition to the cue dimension, size in the present experiments. In so far as these characteristics are the same for both stimulus objects, only one member of each dimension (square form, white, etc.) is present, and, as they receive both reinforcement and non-reinforcement their effective excitatory strengths are not greatly increased. If, however, a considerable amount of overtraining is provided all of the stimulus characteristics are increased in excitatory value since all responses are correct and consequently followed by reinforcement. Just what effect such differences in the level of strength of these non-cue stimulus characteristics may have, it is not possible to say a priori. Possibly they would not affect the differential nature of the response but only the vigor of the reaction. On the other hand, it is possible that the amount of difference between excitatory strengths of the cue aspects necessary to produce a differential response is related to the level of strength of the remaining stimulus aspects. This point is of particular importance in connection with the

problem of equivalence of stimuli when more than one stimulus aspect is changed.

Another question that is important from several points of view is the nature of the development of the curves of generalization during training. The theoretical implications of the effects of overtraining would depend to a considerable extent on what happens to these curves, that is, whether the range narrows, broadens or remains unchanged with continued training. The effects to be expected from employing larger differences between the training stimuli would also depend most importantly on the manner in which the generalization curves develop. It is planned to take up the various theoretical aspects of this problem in a subsequent paper.

Similarly, there are very likely numerous other factors that play more or less important parts in this kind of discrimination behavior. As yet, however, only the barest beginning has been made in the experimental analysis of these phenomena. In this connection one cannot help but be struck by the relatively small amount of progress that has been made in this field of research since the initial work of Kinnaman in 1902. While it is true that the problem was a more or less incidental one in the investigations of the early American psychologists, to the gestalt or configuration psychologists it has been of crucial importance. Instead, however, of a really systematic investigation, the latter seem to have been satisfied to demonstrate the commoness of response on the basis of relational properties as compared with response to absolute factors. Instances of failure of relational response have either been ignored as merely chance occurrences, or vaguely accounted for in terms of a threshold of equivalence of structure-properties.

The gestalt theories have failed to furnish either a satisfactory explanation of these phenomena or an adequate experimental formulation of the problem.[8] The present

[8] The writer does not wish to deny the possibility that a theory of this type may be developed which will be capable of accounting for these experimental facts satisfactorily. Such dogmatic denials have no place in the realm of science. At the same time, however, we would emphasize the fact that the burden of the proof devolves on the theory. Its only claim to consideration lies in the extent to which it leads logically to consequences which coincide with empirical events.

theoretical scheme, on the other hand, does provide a basis for a systematic experimental attack in this field of study. It possesses, moreover, that most important attribute of a *scientific* theory—the capacity to generate logical implications that can be experimentally tested.

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